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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur radio

All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 150 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The heavy duty PS-50 power supply is needed for continuous duty.)

- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM in today's crowded bands.
- **MC-42S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **Full or semi break-in CW; AMTOR compatible.**

Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S-88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-4/5/6/7 headphones
- SP-40/50 mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2C extra DC cable.

Kenwood takes you from HF to OSCAR!

25th Anniversary

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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

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NEW! Computer Interface!

"DX-cellence!"

TS-940S

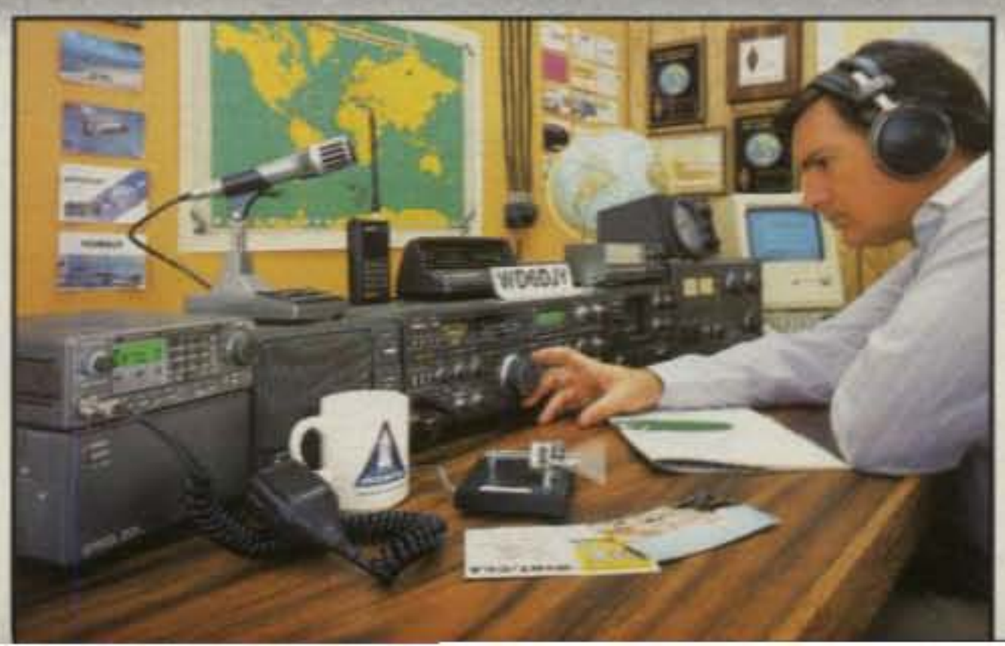
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT- 940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:

• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

Interface IF-232C/IF-10B



Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

More TS-940S information is available from authorized Kenwood dealers.

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NEW!
Computer Interfac

Complete Control...

IF-232C Level translator

IF-10A Computer interface for TS-711A/TS-811A
IF-10B Computer interface for TS-940S
IC-10 IC kit for TS-440S computer control

Attention "computing" hams! The Kenwood IF-Series computer interface units will enable you to connect your TS-711A, TS-811A, TS-940S, or TS-440S transceivers to your home computer. RS-232C standard is used, so the interface units are compatible with any computer!

The IF-10A and IF-10B computer interface boards and IC-10 IC kit are designed to be installed inside the transceivers. Control is performed via the computer RS-232C port and through the IF-232C level translator. The level translator performs two functions: (1) converts voltage levels from the RS-232C port to the TTL levels in the transceiver, (2) and acts as a noise supressor. A complete interface "kit" would include the appropriate computer interface units (IF-10A, IF-10B, or IC-10) and the IF-232C level translator.

The applications of automated station control are almost endless! Just imagine...work DX from your hand-held...operate OSCAR "automatically"...remote operation of your station...or put together the "ultimate" contest station....

CRT display shown is a sample program, not available from Trio-Kenwood Communications.

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

25th Anniversary

Short Wave Listener's map an directory—simply select the QTH yo like to listen to, a the pre-programm frequency is "dialed up."

Display frequency band, and mode data. Control you rig via keyboard!

- **Interchangeable commands**
This means that one program may be used with several rigs, to minimize program changes.
- **Simultaneous operation of the computer and transceiver is possible**

- **Powerful, easy-to-understand instruction set**
- **Wide variety of commands**

Memory input and recall, frequency selection, frequency step, sub-tone frequency, offset, antenna tuner, DCS, scan, and many, many more functions are accessible with the Kenwood computer interface unit!

- **AC-10 AC power adapter (optional)**

More IF-232C and computer interface information is available from authorized Kenwood dealers.

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CQ The Radio Amateur's Journal

ON THE COVER: In case you can't tell just who that is, it's Ron Moorefield, W8ILC waving at us. Ron climbed the tower so we could have this shot for our Antenna Special cover. TNX Ron. Photo by Larry Mulvehill, WB2ZPI.

APRIL 1986 **VOL. 42, NO. 4**

FEATURES

DEPARTMENTS

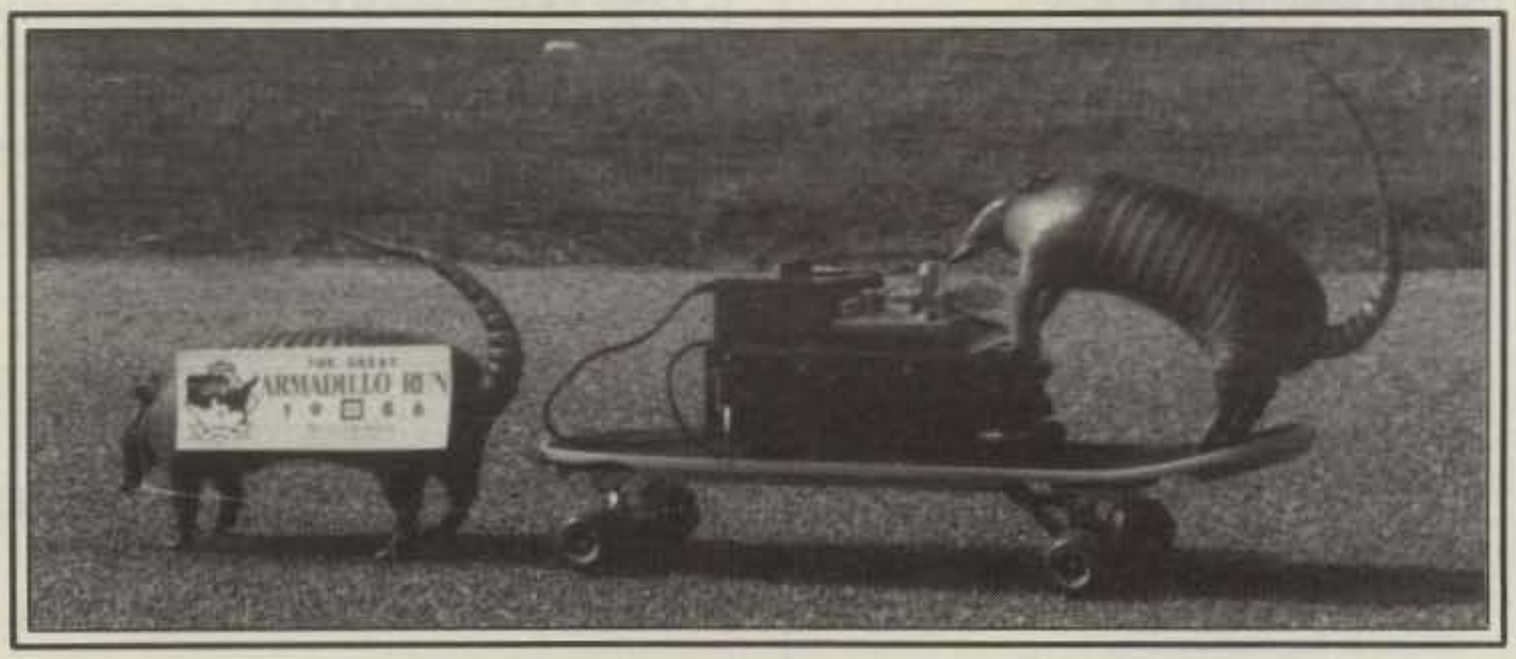
Zero Bias

AN EDITORIAL

Well, this is it! The month that amateur radio waits for, and specifically the last weekend in this month. It's Dayton. What else could stir the hearts and minds of amateurs throughout the world? If you've ever been there, you know the excitement and wonderment generated in those three days. If all you've done is hear about Dayton, it's really two or three times better than any story could relate. If you're too jaded and blase to think that there would be anything there to catch your fancy, then perhaps you should think of a new hobby. It's all there in the greatest profusion ever known to amateur radio.

I don't know why Dayton evolved to the size it is, but there is nothing in the world like it. Perhaps it's as simple as everyone goes expecting to have a good time and they do. Seasoned Dayton goers talk about the number of Daytons they've been to as if qualifying for an endurance award. Everything new in amateur radio will certainly be there, along with just about everything that is currently commercially available. It's all there to see, touch, and try out. Over 400 commercial exhibits alone will dazzle you into creating a giant wish list. The gigantic fleamarket offers just about everything imaginable to delight the amateur. Whatever particular aspect of amateur radio you enjoy, it's there waiting for you to take it home. There are talks, forums, and meetings on every subject led by people you've only heard or read about. These are the recognized experts who are there to show you how it's done and how you can do it, too.

Give it a try this year. There's still time. Hotel accommodations are very scarce, but it's certainly worth the trip to find out for yourself what everyone talks about when they say "Dayton."



I don't know if it's quite right to classify armadillos as hams, but these two fellows are getting set for a little mobile operation. Perhaps they'll take turns operating and pulling during the Texas DX Society's Great Armadillo Run coming up next month. I would expect that they will take part in the CW portion.

The CQ WW VHF WPX Contest

The results are in! To all those who entered, we thank you for making our first VHF Contest a tremendous success. The results will be published in our June issue. We've taken a lot of your suggestions to heart in structuring the rules for the next big one in July. The new log sheets should be available this month so you can send in early for your share. The response truly has been worldwide, and a lot of amazing scores were submitted. Start getting your station in order and getting yourself in shape for the next one.

This coming weekend will see us at the big local event, the LIMARC fleamarket here on Long Island. Before we get to Dayton, however, we will be at the Orlando Hamfest and the big one in Charlotte, North Carolina. Let's see how many of you can get out of the house this year to attend some of these events. Be sure to stop by the *CQ* booth to say hi. While you're at it, why not bring a nonamateur with you to show him or her just what it is we do. It might also make a great field trip for a local science class and an extra motivator for a group starting an amateur radio course. Let's all try to have a good time with amateur radio this year and also encourage others to give us a try.

Only In Texas

Speaking of good times, remember that next month starts the Great Armadillo Run. Check the January issue for complete details. The phone portion of this monumental event is scheduled to kick off on May 3rd, so make your plans accordingly. There are numerous souvenirs available to participants, and this operating event is in typical Texan fashion—BIG. If you're in need of any county for an award credit, this is a sure way to get it and have a lot of fun to boot. See the photo of the advance party of mascots leaving to check out the route and propagation conditions. We thank the Texas DX Society for thinking up this one and for the tremendous amount of work involved to bring it off in true Texas style.

Still Undecided

As of this writing, RM-5038, the Novice Enhancement Petition, is still an open issue, but it does look good for 1986. While this proposal will not open a floodgate of new amateurs, it will have a lot to offer a prospective amateur in the way of privileges. It is the best compromise so far between the no-code and pro-code factions.

The same up-in-the-air status exists for HR-3378 and S-1667, the Telecommunications Privacy Act of 1985. Although many amateurs seek only to exclude amateur radio from this one's talons, let's look at this one's ramifications with regard to everyone. The Privacy Act is really not good for anyone, let alone amateurs. To simply be excluded from its provisions does not make it right. It still maintains that the basic premise is correct and that amateurs have special license that the general population doesn't. To seek an exclusion is giving tacit support for the legitimacy of the premise. The premise is wrong.

Antenna Special

While we all know that a raging blizzard, torrential downpour, and sub-freezing temperatures are actually the best times to work on antennas, April is the optimum time to read about antennas. I guess this is because we use the warmer weather to get rid of the colds, frostbite, and casts from our limbs which we received from working on antennas in the winter. This is the first of our two annual Antenna Specials (the other is the August issue), and it should give you plenty of time to get some good ideas on improving your setup before next winter.

Travels With CQ

This is being written about a week after our first hamfest of the 1986 season—Miami. Had circumstances allowed, this would have been our second, as we had originally planned on going to the Wheaton one-day show in Chicago the week before. There was too much work around here to get away that weekend, and so we'll try again next year. I've heard from folks who were at the new location in Chicago—the Arlington racetrack fire destroyed the traditional site—that the turnout was very good and a great time was had by all. The previous year was the year of the Hamsicle, where the temperature dropped to −27°. This year the weather cooperated.

The Miami trip had an auspicious start on Friday, February 7th, as New York was gripped in a snow storm. After a few hours of delays due to airport closings, deicing procedures, and runway plowing, we finally left frigid New York expecting to bask in the Miami sun that afternoon. No such luck. We arrived in time to land with a departing tornado, which made us grasp the fundamentals of wind sheer really fast. The weather was very wet. We were greeted by heavy rains which lasted all the rest of the day. It was warm, though. The show was also at a new location this year, farther away from the convention hotel. The new site had everything going for it—size, ample parking, indoor fleamarkets, and plenty to see and do. The only thing lacking was an adequate air-conditioning system. Miami was very well attended, and the weather was perfect. Consequently, it was hot and crowded. A little cool air and it would have been perfect.

Sabbatical Leave

Dr. Theodore Cohen, N4XX, our Washington columnist and co-author of the *Shortwave Propagation Handbook*, will begin a sabbatical leave this month due to work commitments. Ted will keep us informed as to doings in the nation's capital as they arise. However, there will be no regular columns during this period.

73, Alan, K2EEK

UNIVERSAL PACKET CONTROLLER model PK-80

$219.95 Suggested Amateur Net Price

The AEA model PK-80 is a wired, tested, and calibrated version of the famous TAPR TNC-2 and comes with a one-year conditional AEA warranty.

You can interface the PK-80 with any ASCII terminal or a personal computer and standard terminal software. The PK-80 is loaded with all the latest AX.25 version 2.0 software and advanced packet hardware circuitry that makes the TNC-2 the newest benchmark for comparision.

Compare the following as representative of the advanced new features relative to the competition.

- Hardware HDLC for full duplex
- True Data Carrier Detect (DCD) for HF operation
- Operates with 300, 1200, 2400, 4800, and 9600 baud terminals
- Five front-panel status indicators
- Multiple connect
- Connect check (poll final bit) fully implemented
- Connect AUTO response message
- Only three commands necessary for making standard contacts
- 82 software commands possible for the most demanding requirements

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AEA BRINGS YOU THE BREAKTHROUGH

UPGRADE YOUR TNC FOR H.F. PACKET OPERATION

$169.95 Suggested Amateur Net Price

Virtually all existing Packet Terminal Node Controllers (TNC's) use phase-locked-loop detection or a "World Chip" decoder intended for telephone quality circuits. These schemes work well for VHF FM radio operation, but leave a lot of room for improvement in H.F. radio environments.

The new AEA Model PM-1 Packet Modem is designed to interface between your existing TNC and your radio. **No internal modifications** to your TNC or radio are necessary. The PM-1 contains independent dual channel filtering with A.M. detection for maximum sensitivity and selectivity under poor H.F. conditions. The PM-1 is optimized for 300 baud operation. A shift frequency of 200 Hz or 600 Hz may be selected from the front panel.

A front panel bar graph tuning indicator is provided to assist the user in precise H.F. tuning of an incoming packet radio signal. There is also a front panel squelch control (variable DCD) provided for sensitivity adjustment under various noise conditions. Just to make your TNC as flexible and useful as possible, we have included two output radio cables. Now you can switch between VHF and HF packet operation by simply pushing this PM-1 front panel switch.

Enjoy Packet Radio to its fullest with the new AEA model PM-1 Packet Modem. Work DX on the low bands and monitor packet mail boxes from the other side of the country. See the PM-1 at your favorite dealer now.

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AEA BRINGS YOU THE BREAKTHROUGH

Our Readers Say:

Pen Pal Wanted

Editor, *CQ*:

I would be most grateful if you would print this in your letters column.

I would like a pen pal in the U.S.A. or Canada. I am a 17-year-old boy who is in the jewelry trade, and my hobby is amateur radio. I am a "B" class license holder, so I can only use VHF and up, but I do a lot of shortwave listening. I intend to pass the CW test and get onto HF one day, though.

My other interest is listening to rock music. I would write to anyone, male or female, but would prefer someone with interests similar to mine. That is not too important, however (neither is age, by the way).

Thank you very much for the ace magazine.

Mike F. Newell, G1HGD
11 Lancaster Place
Kenilworth, Warwickshire
CV8 1GL England

Heard Island Odyssey

Editor, *CQ*:

Part of the fun of DXing is trying to imagine yourself in the shoes of the operator at the other end of the QSO. While sitting in a comfortable hamshack, it takes a major helping of imagination to project yourself into a dense jungle or onto a remote island.

I just finished reading a book that made me feel part of one of the most exciting expeditions in memory. The book is *Heard Island Odyssey* by Kirsti Jenkins-Smith. Kirsti's writing reminds me of the classic DX chronicles of Danny Weil and Gus Browning. Rather that dwelling on the technical aspects of the expedition, Kirsti weaves a tale of the human side of travelling to one of the most remote corners of the globe. She fills in the part of the adventure that is so often overlooked in ham literature. While reading her book, I gained a true appreciation for the human side of travel to this incredible place.

Heard Island Odyssey describes the 1983 expedition to Heard Island organized and led by Jim Smith. The book doesn't dwell on the DXpedition aspects of the adventure, making it equally appealing to DXers, non-DXers, and even non-hams. The book contains 20 pages of photos. I was able to finish it in one evening while the bands were dead.

I don't know how "Heard Island Odyssey" will be distributed, but I got my copy by sending a check for $14.45 ($9.95 for the book, $4.50 for airmail) made payable to "HIDY-Y" to: HIDY-Y, c/o P.O. Box 90, Norfolk Island, Australia 2899.

Bob Farkaly, K9RHY
Libertyville, IL

WPX Award Outstanding

Editor, *CQ*:

I've just received the WPX certificate #2342 for CW, and I am certainly pleased with it. The artwork is outstanding, especially the beautiful calligraphy work. There is no doubt in my mind that your certificate is the best I have ever received from any organization.

The WPX Awards Manager deserves to be congratulated on his diligence in verifying all my prefixes which were submitted. Thank you very much.

Joe Rice, W4RHZ
Covington, KY

Remember The Senior Citizens

Editor, *CQ*:

Your Editorial in the November 1985 issue was *very* impressive, provoking considerable thinking. First, I'm not sure I share your thinking regarding associating amateur radio with introverts. The great majority of local ham friends are extroverts. Also, their outward appearances do not reflect their high level of intelligence.

You concentrated on young people as a group for future hams. May I suggest you give thought to older people, "Senior Citizens." And may I give my personal experience as a humble example.

I am a WW I veteran, retired in 1968 when I was 68. I had a hobby at that time of guarding, and some photography. However, I needed a hobby to exercise my brain to prevent it from atrophying. Also, in case of becoming less mobile, I needed a vehicle to contact the outside world. Later I also learned that the hobby was closely associated with God because of the many miracles involved, including the phenomenal speed of a radio wave. My basic schooling involved steam and its many uses.

So with some study, membership in our local club to learn the "language," and membership in the ARRL, I passed and received my Novice license in February 1979. Then with additional study and encouragement from an "Elmer," I passed and received December 12, 1983 my General license. That was a unique Christmas present and a very self-satisfying achievement at my age. I am now beginning to study for my Advanced class license. That is my present challenge.

Retired people require both physical and mental activity to prolong life. Amateur radio has fulfilled all my prerequisites and more.

Senior citizens number about 30 million in the U.S. They are a virgin group to recruit from.

E.D. Stoetzel, KA9DKS
Washington, IL

SANTEC ST-20T

a SMART Radio... the INTELLIGENT Choice

	VHF FM TRANSCEIVER MODEL ST-20T	UHF FM TRANSCEIVER MODEL ST-40T
Suggested Retail	$349.95	Coming 1st Quarter 1986
Frequency Range	142.000 to 150.995 MHz	440 MHz to 449.975 MHz
Type of Emition	F3	F3
Memory Channels	10 Channels	10 Channels
Antenna Impedance	50 ohms	50 ohms
Power Source	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
Selectivity	± 15 KHz at 60dB down	± 15 KHz at 60dB down
Audio Output Power	400mW at 8 ohm	400mW at 8 ohm

Note: See Accessory List for ST-200 for Compatible Accessories.

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TOKYO HY-POWER LABS, INC.

VHF AMPLIFIERS AND PREAMPS

HL-102V

220 MHz

HL-22V

220 MHz

HRA-2

HRA-7

MODEL	HL-102V 220 MHz AMPLIFIER + PREAMP	HL-22V 220 MHz FM AMPLIFIER 20 WATT	HRA-2 MAST MOUNTED GaAsFET PREAMP 2 METERS	HRA-7 MAST MOUNTED GaAsFET PREAMP 70 CM
Sugg. Retail	$259.95	$99.95	$129.95	$129.95
Description	220 MHz all mode amp with low noise FET type preamplifier. 90 Watts out from 10 OR 25 Watts drive.	220 MHz VHF FM Amplifier GaAsFET Preamplifier	Mast mounted pre-amplifier using GaAsFET technology for lowest noise in the active device.	Mast mounted pre-amplifiers using GaAsFET technology for lowest noise in the active device.
Frequency Range	220-225 MHz	220-225 MHz	HRA-2: 2 Meters	HRA-7: 70 CM
Modes	SSB, CW, FM	FM	SSB/FM	SSB/FM
Supply Volts @ Amps	DC + 13.8V @ 18A	DC + 13.8V @ 5 AMPS	9-12 @ 200 mA	9-12 @ 200 mA
R.F. Power-Out (AVG)	90 W	20 W	GAIN: HRA-2 20 dB	GAIN: HRA-7 18dB
R.F. Power-In (NOM)	10 OR 25 W	3 W	Noise Fig.: HRA-2 1.0 dB	Noise Fig: 0.8 dB
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'N'	TYPE 'N'
Pre-amp Type	F.E.T.	GaAsFET	GaAsFET Semiconductor Helical Resonator	GaAsFET Semiconductor Helical Resonator
Output Meter Type	LIGHTED METER	L.E.D.	N/A	N/A
Dimensions	172W x 60H x 263D m/m	100W x 35H x 150D m/m	180W x 82H x 75D m/m	180W x 82H x 75D m/m
Weight	2.5 Kg	520g	550g	550g

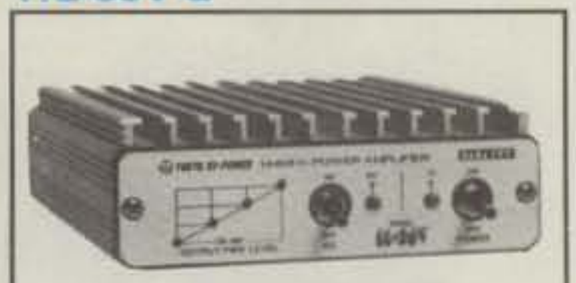
VHF LINEAR AMPLIFIERS

HL-160/V25

HL-110

HL-85

HL-35V-L



MODEL	HL-160V and HL-160V25 VHF 160W OUTPUT METER PREAMP	HL-110V VHF AMP 100 WATTS OUTPUT METER PREAMP	HL-85V VHF 80 WATT GaAsFET PREAMP METERING	HL-62V VHF SSB/FM AMP, GaAsFET PREAMP	HL-35V/L VHF FM/SSB AMP 25 WATT GaAsFET PREAMP
Sugg. Retail	$379.95 HL-160V $299.95 HL-160V25	$259.95	$189.95	$169.95	HL-35V $89.95 HL-35V/L $99.95
Description	144 MHz all mode amp with low noise FET type preamplifier. 160 Watts out from 3, 10, Watts with 160V (25 W 160V25)	144 MHz all mode with MOS-FET preamp	144 MHz all mode amp with low noise GaAsFET type preamplifier. 80 Watts Output with 10 W drive.	144 MHz all mode amp with GaAsFET type pre-amplifier.	VHF multi-purpose amplifier for SSB or FM. ECONOMICAL Best Buy in $/Watt with SSB capability and GaAsFET PRE-AMPLIFIER.
Frequency Range	144-148 (Export Available 150-160 MHz)	144-148 MHz	144-148 (Export Available 150-160 MHz)	144-148 MHz	144-148 MHz
Modes	SSB, CW, FM	SSB,CW,FM	SSB, CW, FM	SSB, CW, FM	FM(35V) FM/SSB/CW (35V/L)
Supply Volts @ Amps	DC + 13.8V @ 23A (V25: 22A)	DC + 13.8V @ 15 AMPS	DC + 13.8V @ 12 amps	DC + 13.8V @ 7.5 A	DC + 13.8V @ 4 Amps
R.F. Power-Out (AVG)	160W	100 Watts	80 Watts	60 W	25 Watts
R.F. Power-In (NOM)	3 or 10 (V25: 25W)	10 Watts	10 Watts	10 Watts	2.5 Watts
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'
Pre-amp Type	F.E.T.	MOS-FET	GaAsFET	GaAsFET	GaAsFET
Output Meter Type	LIGHTED METER	LIGHTED METER	LIGHTED METER		L.E.D.
Dimensions	218W x 82H x 299D m/m	172W x 60H x 263D m/m	172W x 60H x 184D m/m	150W x 45H x 164D m/m	100W x 35H x 150D m/m
Weight	3.5 Kg	2.2 Kg	2.0 Kg	1.2 Kg	520g

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WELZ CORP.

POWER METERS

SP-825
1.8-1300 MHz

SP-425
140-525 MHz

SP-225
1.8-200 MHz

SP-122
1.6-60 MHz 2kW

Model	SP-825 AUTOMATIC SWR 1.8 - 1300 MHZ	SP-425 DUAL METER VHF/UHF	SP-225 DUAL METER HF/VHF	SP-122 HIGH POWER HF	SP-450 HIGH POWER VHF
Suggested Retail	$169.95	$119.95	$119.95	$89.95	$149.95
Freq Range	1.8-200, 430-450, 800-930, 1240-1300	140-525 MHz	1.8-200 MHz	1.6-60 MHz	140-470 MHz
Power Range (FWD)	2-15-150 W	5-15-150 W	5-15-150 W	20W-200W-2KW	50-300-1500W
(REF)	1-3-30	1-3-30 W	1-3-30 W		
Accuracy (FWD)	± 10% F.S.	± 7% F.S.	± 7% F.S. (160-200 10%)	± 10% F.S.	± 10% of Full Scale
(REF)	± 10% F.S.	± 10% F.S.	± 10% F.S.	± 10% F.S.	
SWR Sensitivity	SENSOR S-1: 2W; S-2:2W	2.5 WATTS	1 WATT	3 WATTS	30W
Insertion Loss	SENSOR S1:0.2 dB; S2:0.3 dB OR LESS	140-250: 0.1 dB 250-400: 0.2 dB 400-525: 0.3 dB	0.2 DB OR LESS	0.1 DB OR LESS	Less than 0.1 db
Available Measurements	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR, SWR, PEP	AVG PWR, REF PWR, VSWR
Connector Type	S1: 'M' TYPE S2: 'N' TYPE	'N'	'M'	'M'	'N'
Indicators	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	
Power Required	DC 13.8V 400 mA	DC 13.8V 300 mA	DC 13.8V 300 mA	DC 13.8V 200 mA	NONE
Size	192W × 72H × 65D m/m	192W × 72H × 65D m/m	192W × 72H × 65D m/m	120W × 72H × 85D m/m	160W × 65H × 133D m/m (body)
Weight	1240g	850g	850g	680g	1.15 kg
Sensor Type	EXTERNAL TWO SENSORS	INTERNAL	INTERNAL	INTERNAL	EXTERNAL REMOTE

SP-220
1.8-200 MHz 200W

SP-230
1.8-150 MHz 750W

SP-600
1.8-500 MHz 2kW

SP-450
140-500 MHz 1500W

Model	SP-220 SINGLE METER HF 200W 1.8-200	SP-420 VHF/UHF SINGLE METER	SP-230 SINGLE METER HF 150W	SP-430 VHF/UHF SINGLE METER	SP-600 3 SENSOR HI-PWR 1.6-500
Suggested Retail	$59.95	$74.95	$49.95	$49.95	$159.95
Freq Range	1.8-200 MHz	140-525 MHz	1.8-150 MHz	140-150 MHz; 420-450 MHz	S1: 1.6-60; S2: 1.8-200; S3: 130-500 MHz
Power Range (FWD)	2-20-200W	4-20-200W	15W-150W	5 W - 60 W	S1: 20W-200W-2KW S2, S3: 20W-200W
(REF)					
Accuracy (FWD)	± 7.5% F.S. (2W: 5% F.S.)	± 10% F.S. or better	± 7% F.S.	± 7% F.S. or less.	± 10% F.S.
(REF)	FWD PWR AT 160-200 MHz: 15%				
SWR Sensitivity	1 WATT	1 WATT	2 WATTS	2 WATT	S1:1.5W S2:1W S3:2W
Insertion Loss	0.2 DB OR LESS	0.2 dB	0.2 DB OR LESS	0.2 dB	S1:0.1 S2:0.1 S3:0.25dB
Available Measurements	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR	AVG. PWR., SWR	FWD PWR, REV PWR, VSWR
Connector Type	'M'	'M'	'M'	'M'	'M'
Indicators	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR VOLTMETER FOR CAR	LED FOR TRANSMIT, ON-AIR VOLTMETER FOR CAR	LED RANGE INDICATORS
Power Required for Lamps	DC 13.8V 300 mA		DC 13.8V 100 mA	DC 13.8V 100 mA	13.6 VDC FOR LIGHTS
Size	120W × 72H × 85D m/m	120W × 72H × 85D m/m	110W × 67H × 36D m/m	110W × 67H × 36D m/m	220W × 91H × 113D m/m
Weight	540g	540g	270g	270g	1.7 Kg
Sensor Type	INTERNAL	INTERNAL	EXTERNAL	EXTERNAL	INTERNAL

DIAMOND

ANTENNAS AND ACCESSORIES

DP-EL770H DUAL BANDER

Suggested Retail
$39.95

Features
120 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
A ⅝'s wave load whip for VHF and stacked ⅝'s waves for UHF. Mounts are available. Perfect for dual band radios with amps.

Gain (dB GP = 0)
3.0 dB (VHF), 5.5 dB (UHF)

Input Power
120 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.98 M

Weight
210 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-EL770E DUAL BAND

Suggested Retail
$34.95

Features
50 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
A ⅝'s wave load whip for VHF and stacked ⅝'s waves for UHF. Great for dual band radios. Duplexers available separately. Mounts available.

Gain (dB GP = 0)
3.0 dB (VHF), 5.5 dB (UHF)

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.98 M

Weight
210 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR770 DUAL MOBILE

Suggested Retail
$34.95

Features
Dual Band Fiberglass Antenna. Standard 'M' Connector Mount. Easy Installation. Rugged Construction.

Description
A ¼ wave for VHF and ⅝'s wave for UHF. Rugged dual band antenna.

Gain (dB GP = 0)
0 dB (VHF), 3.42 dB (UHF)

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56 M

Weight
320 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR701 UHF or DP-SR201 VHF MOBILE

Suggested Retail
$29.95

Features
50 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
Fiberglass Encased ¼ wave type spring base mobile antenna. Rugged Construction.

Gain (dBi)
2.15 dB-SR201
3.42 dB-SR701

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56 M

Weight
380 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR120 1200 MHZ MOBILE

Suggested Retail
$34.95

Features
1296 MHz Fiberglass Antenna. Low Loss 'N' Connector Mount. Easy Installation - No Tuning.

Description
Colinear Gain array in an easy to use fiberglass form. Rugged antenna spring base. Spring base screws to mount.

Gain (dB GP = 0)
5.15 dB

Input Power
50 Watts

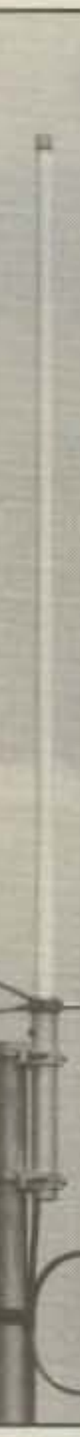
Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56

Weight
320 gm

Mount Model
DP-SPN Magnetic Mount
DP-K4TN Trunk Lid Mount



DP-BDY770 DUAL BAND BASE/REPEATER

Suggested Retail
$79.95

Features
High Power - 200 Watt Capability Standard 'M' Connector. Easy Installation.

Description
Stacked ⅝'s wave C-loaded for both VHF and UHF usage.

Gain (dBi)
2.8 dB (VHF), 5.8 dB (UHF)

Input Power
200 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.3 M

Weight
1 kg

Mount Model
Provided for 30-62 mm dia mast. Nothing else to buy.

DP-BDY790 DUAL BAND BASE/REPEATER

Suggested Retail
$89.95

Features
High Power - 200 Watt Capability Standard 'M' Connector. Easy Installation.

Description
Stacked ⅝'s waves C-loaded for both VHF and UHF useage.

Gain (dBi)
4.5 dB (VHF), 7.2 dB (UHF)

Input Power
200 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.7 M

Weight
1 kg

Mount Model
Provided for 30-62 mm dia mast. Nothing else to buy.

DP-BDY121B 1200 MHZ BASE/REPEATER

Suggested Retail
$99.95

Features
High Gain 18 Element Colinear. Low Loss 'N' Connector. Easy Installation.

Description
18 Elements in a fiberglass package. 100 Watt capability for repeater use.

Gain (dBi)
12.0 dB

Input Power
100 Watts

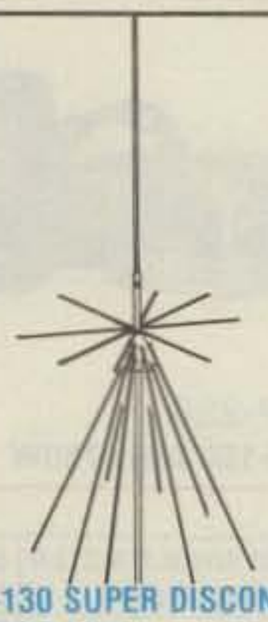
Impedance
50 Ohms

VSWR
1.5:1 or less

Length
2.0 M

Weight
0.9 kg

Mount Model
Mounts to 30-62 mm diameter pole.



D-130 SUPER DISCONE WIDEBAND

Suggested Retail
$69.95

Features
25-1300 MHz Super-Discone Antenna. Transmit on 50,144,430, 1200 MHz Monitor 25-1300 MHz with one antenna.

Description
All stainless steel discone and vertical radiator for TX. Rugged Construction, wide bandwidth

Gain (dBi)
0 dB

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.7 M

Weight
1 kg

Mount Model
Adapts to 25-50 mm masts.

DP-RH2SB 'RUBBER DUCK'

Suggested Retail
$11.95

Features
Diamond Duck - Helical Whip. Standard 'BNC' Connector Mount. 144-148 MHz

Description
Replacement rubber coated whip for handy talkies.

Input Power
5 Watts

Length
10.4 cm

Impedance
50 Ohms

Weight
25 gm

Mount Model
HT BNC

DP-RH7SB 'RUBBER DUCK'

Suggested Retail
$11.95

Features
Diamond Duck - Helical Whip. Standard 'BNC' Connector Mount. 440 MHz Band

Description
Replacement rubber coated whip for handy talkies.

Input Power
5 Watts

Length
6.8 CM - RH7
10.4 CM - RH2

Impedance
50 Ohms

Weight
20 GM

Mount Model
HT BNC

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FM-740 70 cm

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- 16 button speaker/mic with UP/DN lock-out switch
- VFO Steps Size—2.5-40KHz, programmable (× 10 with Speed on)
- Band Scan—Programmable limits and modes, CARRIER, AUTO & DELAY. Scan steps same as set for VFO steps.
- Memory Scan—Programmable modes, SKIP, CARRIER, AUTO & DELAY.

FM-240
Suggested Retail $369

FM-740
Suggested Retail $429

Limited time offer - Free MS-20 external speaker with purchase of FM-240 or FM-740. See your dealer now.

Specifications KDK FM-240 (and FM-740)	
General	
Supply Voltage	13.8v ± 15%, negative ground.
Consumption	Transmit: 1.5A @ 5w, 5.5A @ 25w Receive: .4A @ 0 sig., .6A @ max volume.
Temp. Range	– 10 deg. C to 60 deg. C.
Dimensions	40H × 140W × 170D mm (Body only)
Weight	1.0Kg (Body only)
Transmitter	
Freq. Range	FM-240 142.000 - 150.00 MHz (FM-740 440.00 - 449.975 MHz)
Output	High = 25 watts, Low = 5 watts (High = low, (Low = 1W) (FM-740 High = Low)
Modulation	Variable reactance frequency modulation
Max. Deviation	± 5KHz
Spur. Emmis	More than 60dB down from carrier
Duplex Offset	Programmable ± .1 to 12.7MHz (set at ± .6KHz ex-factory)
Tone	Programmable 74-250.3 (34 EIA tones) Encode and Decode
Receiver	
Int. Freq	1st = 10.7MHz, 2nd = 455KHz (1st-21.4MHz 2nd-455KHz)
Sensitivity	Better than 12dB SINAD @ .2uV
Squelch Sens	Better than .15uV
Bandwidth	+ 6KHz @ – 6dB
Selectivity	+ 12.5KHz @ – 60dB
Image Ratio	Better than 70dB
Audio Output	More than 2w, 8 ohms load, 10% THD
Standard Accessories	
Speaker Microphone	Speaker = 8 ohms, Mike = Condenser type. SM-34A: UP/DOWN plus tone encoder.
Power Cable	2 meters, with 7A fuse.

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- Broadbanded
- HF 500 Watt Linear

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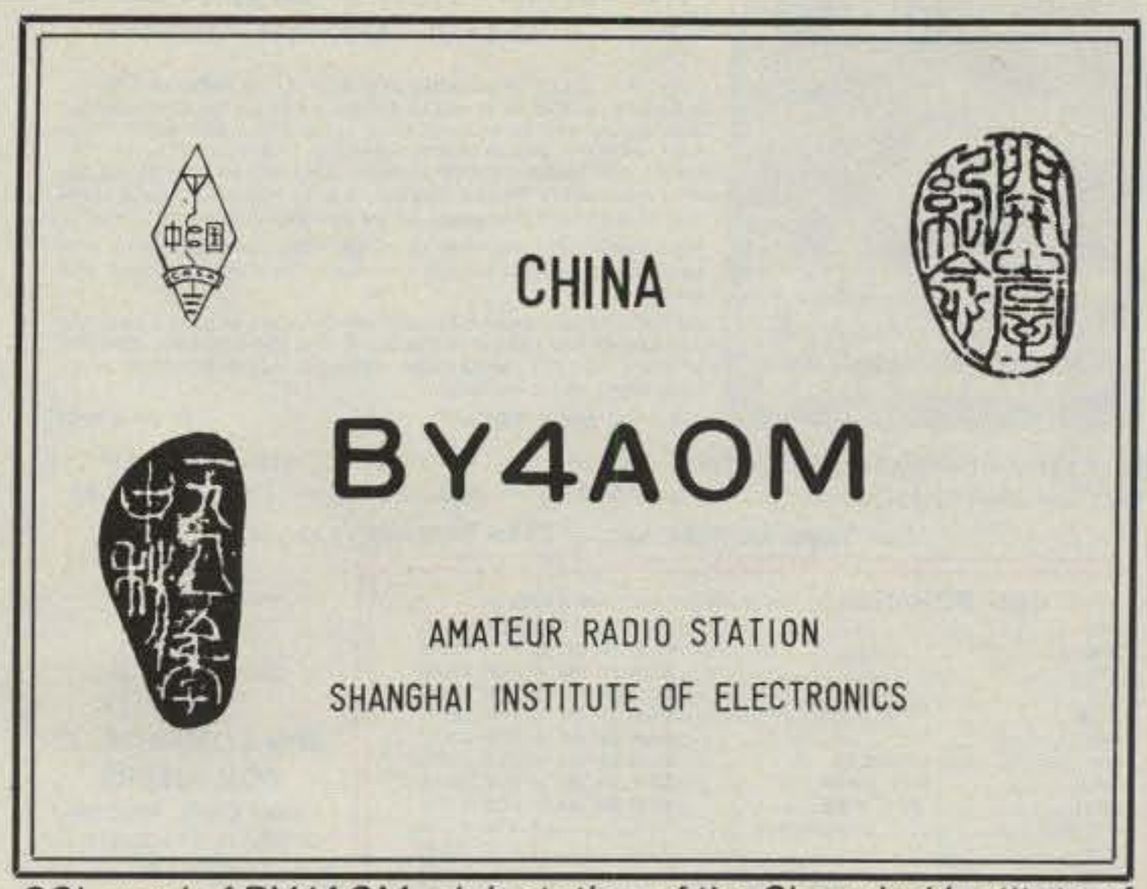
QSL card of BY4AA, amateur radio club station of the China Radio Sports Association.



QSL card of BY4AOM, club station of the Shanghai Institute of Electronics.

Sometimes you can go home again, rekindle old friendships, and see what it's like today. KM2X (ex-C1BC) recently had that opportunity.

A Visit To BY4AA and BY4AOM

BY FRANK WEN*, KM2X (ex-C1BC)

In mid-October 1985 I received a letter from an old amateur friend of mine, M.G. Shen, informing me that a new club station, BY4AOM (meaning **A**ll **O**ld **M**en), had recently been set up in Shanghai, China and was in operation. He and the group anxiously wanted to establish a QSO with me because I used to be one of them back in the 1940s. Due to unfavorable propagation conditions between the U.S. east coast and China, plus the handicap of a ¼-wave vertical ground-plane antenna, a QSO was practically impossible at that time. To their surprise, however, I made a trip to Shanghai and had an eyeball QSO with them in December 1985.

BY4AA is the amateur radio club station of the China Radio Sports Association (CRSA), Shanghai Branch; BY4AOM is the station for the Shanghai Institute of Electronics. BY4AOM is located in a northwest suburb of Shanghai and was close to where I was staying, so I visited it first. The chief operator is John Xie, who held the old 1940s callsign of C1TH. M.G. Shen, ex-C1MK, is the deputy chief. At this writing there are 16 members including Xie and Shen. They are Y.C. Hsu (ex-C1CH), H.Y. Tsen (ex-C1HT and ex-XU8GW), Johnny Tom (ex-XU8WM), Y.C. Hwang (ex-C2CA), S.B. Chio (ex-C1SB), S.C. Kuo (ex-C1ZZ), Y.C. Cheng (ex-XU8EC), C.S. Yok (ex-C1CS), S.L. Lee (ex-C1SL), T.W. Kuo (ex-C1TW), T.F. Chu (ex-C1CSY), B.D. Kuo (ex-C1KBD), Y.T.

(Left to right) S.B. Chio (ex-C1SB), J. Tom (ex-XU8WM), M.G. Shen (ex-C1MK), J. Xie (ex-C1TH), and H.Y. Tsen (ex-C1HT) in front of the Youngster of Shanghai Scientific and Technical Building with BY4AOM's homemade cubical quad antenna visible on top of the building.

*P.O. Box 30548, JFK Station, NY 11430

People's Republic of China radio station license #Ku0021694. Name of station: Amateur Radio Station. Station owner: City's Institute of Electronics. Station location: Youngster Scientific Station, 1401 Yen Chang Road. Station callsign: BY4AOM. Effective dates: July 3, 1985 through July 2, 1990. Authorized organization: Shanghai Municipal Radio Managing Committee. Date of issue: July 3, 1985. Center red stamp meaning "Nationwide Radio Managing Committee."

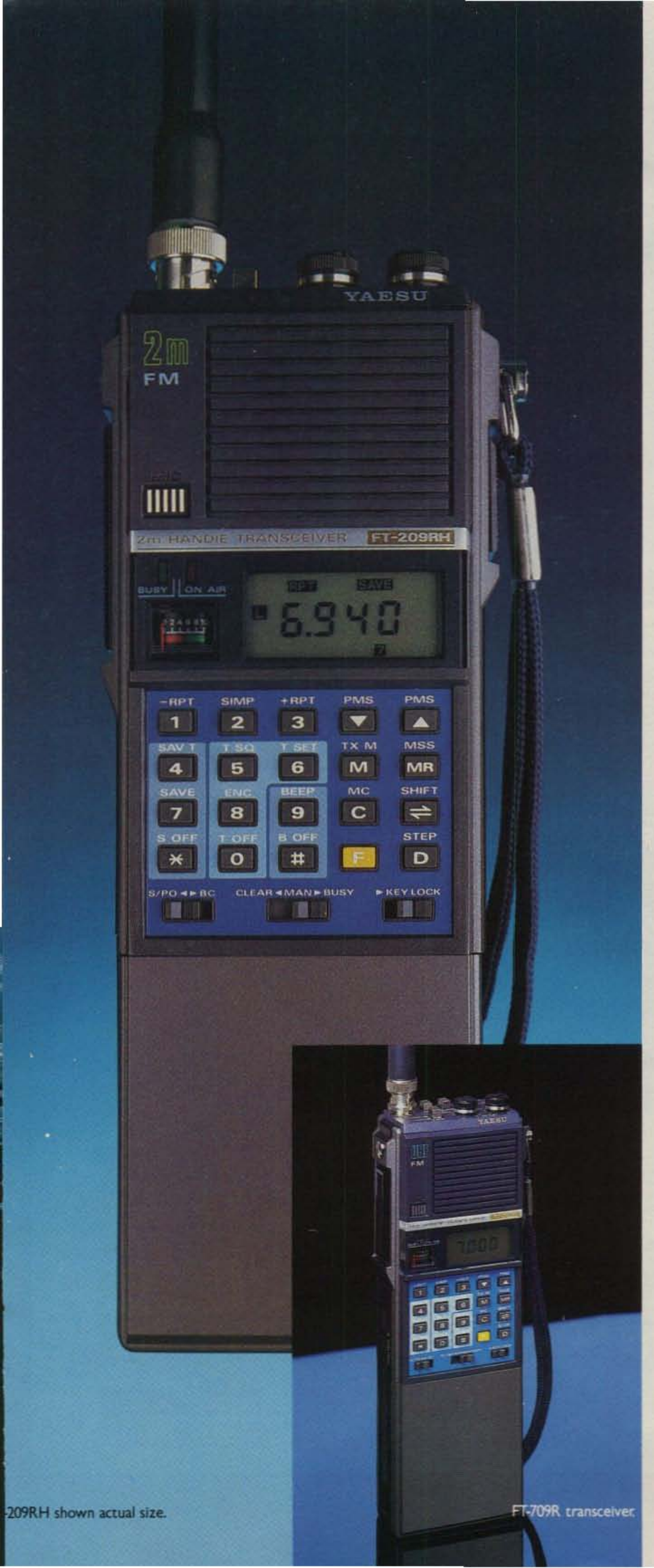
Feng (ex-C1RB), and J.M. Wen (ex-C1BCC); the last one is this writer's younger brother. All of them are diehard "hamaholics." It was noted that everyone is very proud of his individual old callsign. The call each other by the suffix of their callsign rather than by their names.

The equipment at BY4AOM is comprised of a single Drake TR7 with an inoperative digital frequency display. The TR7 was one of two donated to the Chinese by the Boeing Aircraft Company Amateur Radio Club. The other TR7 is being used by BY1SK in Beijing. The TR7 was fed to a homemade two-element cubical quad driven by a rotator modified from some aircraft gear box; it rotated sometimes. Due to a lack of coaxial cable, the feedline is 300 ohm TV twin-lead. A homemade transmatch was used to do the matching.

The members meet twice a week on Saturdays (3–9 pm Shanghai time) and Sundays (3–5 pm). They are on 20 meters, CW and SSB.

Because they had not been on the air for so long, they were not familiar with present operating techniques and procedures. They spent most of the time listening and tried to answer one or two CQ's from a neighboring JA station. After the QSO they started

(Left to right) J. Tom (ex-XU8WM), J. Xie (ex-C1TH), Frank Wen KM2X, and R. XU at BY4AA. Xu is the chief operator at BY4AA.



FT-209RH shown actual size.

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CIRCLE 2 ON READER SERVICE CARD

Frank Wen, KM2X, shown operating BY4AA with J. Tom (left) doing the logging.

Frank Wen, KM2X (ex-C1BC) met with a group of old friends at BY4AOM. Standing left to right are Y.T. Feng (ex-C1RB), J. Tom (ex-XU8WM), J. Xie (ex-C1TH), and Y.C. Hwang (ex-C2CA).

worrying about the postage for mailing the QSL cards. It took me quite some time to break them in, explaining current QSO and QSL practices commonly used by DX stations.

After spending most of the afternoon at BY4AOM, members of the club and I rushed to visit BY4AA, which is located at a northern suburb of the city. We arrived there at about 5 pm and were welcomed by the chief operator, Mr. Xu Ru, a very nice and polite man. It was a surprise to me when I saw the equipment available. It was comprised of one Kenwood TS930S as the main unit, two ICOM 750s, a Canadian Viewstar linear amplifier, 6 meter, 2 meter, satellite transceivers, plus much more. The antenna was a 6-element tribander. Most amazing was the man-high power house style power transformer and control panel that was used to power the linear amplifier. I also found a 1984 *US Callbook* on the bench with a dot marked next to my call, KM2X. At this point Mr. Xu invited me to operate the BY4AA on SSB. Just before getting on the air, I took a little time to repeat the QSO procedures with the emphasis that they are considered as a rare DX station and should take control of the QSO. Rather than answering CQ's, they should initiate a CQ and work as many stations in the shortest time possible. There still are many stations who need a BY to add to their country list. I wanted them to watch and follow my procedures.

At this time the propagation was favorable for VK and South America, so I asked Mr. Xu to turn the big Yagi southward. I moved to the DX preferred frequency of 14200 from 14320 where they were listening to some JA's. I found an opening and asked three times to ensure that the frequency was not in use. Then I called a short CQ DX twice, which generated an immediate pile-up. While I was operating, John Xie and Johnny Tom were at my side taking notes and logging. In one short hour from 1028–1130 UTC (Dec. 16), 34 QSO's were made with eight different countries—VK, ZL, 3M2, KH2, LU, CE, PY, and DU—Including many famous DXers, such as VK6QG, VK3XV, NY6H/KH2, 3M2DM, etc.

I told them that station identification and signal reports are the two essential elements to be exchanged during a QSO. Operators' name, QTH, and QSL information can be announced once every three or four QSO's to be efficient. QSL cards must be sent. A stack of QSL's can be sent to each country's QSL bureau to save on postage. However, a QSL must be airmailed to the individual station who sends in a QSL with a return SASE (self-addressed stamped envelope). That was the first time they heard about the term SASE and they wanted me to elaborate on how it works. Postage was their biggest headache with their limited budget. One time they were considering throwing a party to raise postage money, and another time they simply discouraged making any QSO's. They were very happy about this QSO and QSL style and the tips I passed on to them. I'm sure they will follow suit in future QSO's and serve the amateur radio community better. We could have stayed at BY4AA longer, but it was a bone-chilling night, and everyone was hungry and our taxi was waiting. All visits, however pleasant, do come to an end.

As mentioned earlier, BY4AA is the club station of CRSA with Mr. Xu as the chief operator. The other operators are S.C. Wu, Y. Chen (a YL), and C.H. Chao. The station operates irregularly and mostly on CW. CQ

Here's an antenna project you build in a weekend and still have time left over to work a few rare ones.

How To Build A Shortened Vertical For 20 And 30 Meters

BY SCOTT M. HOWER*, K7KQ

The completed 20 and 30 meter vertical antenna mounted on the author's roof.

With the decline in sunspot activity, an antenna covering the lower bands was desired to replace a miniature beam used for 10 and 15 meters. A small antenna was required due to local Homeowner Association requirements, but a poor-performance compromise antenna would not be acceptable. It was assumed that 20 meters would still be usable in the upcoming years, and the newly acquired 30 meter band would be an excellent choice for CW DXing. The result of much reading and experimentation was a short trap vertical for 20 and 30 meters with excellent performance; the height of the radiator is less than 10 feet, and the antenna can be built for less than a total of $50.

Most amateurs are under the impression that short antennas yield poor performance. While it is true that as an antenna is made smaller certain tradeoffs are introduced, these tradeoffs do not necessarily mean a reduction in radiating efficiency. Theory tells us this is so, and some excellent articles based on experimentation illustrate that short antennas can be very efficient.[1,2] With a short vertical antenna two items must be treated with importance: ground losses must be minimized and conductor losses must be minimized. The usual good practices of antenna installation apply, of course, such as installing the antenna in the clear. If sufficient care is taken in the design and installation of a short vertical antenna, excellent performance may be expected.

As the height of a vertical antenna is reduced, its radiation resistance is decreased in proportion to the square of its length. If a quarter-wavelength vertical antenna is reduced to one third full size, the radiation resistance is reduced by a factor of approximately nine. Methods such as top loading and linear loading may be used to raise the radiation resistance of the antenna. The efficiency of an antenna can be expressed as

$$\text{Efficiency} = \frac{R_r}{R_r + R_{loss}}$$

where:

R_r = radiation resistance
R_{loss} = loss resistance of conductors, coils, ground losses, etc.

It can be seen that keeping the radiation resistance as high as possible while keeping losses—including ground losses—as low as possible will yield better efficiency.

With a ground-mounted vertical antenna, keeping ground losses to a minimum is the single most important consideration, especially for a shortened antenna with low radiation resistance. An extensive ground system, consisting of 60 or more radials, must be used if the antenna is to be a good performer. By raising the antenna and using an artificial ground plane, ground losses can be minimized. Four resonant radials provide an adequate, low-loss ground-plane system for verticals at base heights of one-half wavelength or more; at base heights below one-half wavelength, more than four radials would be required to provide an adequate ground plane that is of significantly greater conductivity than the lossy earth immediately below the antenna.[3]

The antenna described in this article may be used as either a ground-mounted or elevated radiator. As mentioned earlier, an extensive ground system must be used if the antenna is to be ground mounted. The reader should refer to Sevick's work on ground systems if a truly efficient antenna system is desired. Because of very limited yard area, I chose to go with a roof-mounted artificial ground-plane system using four resonant radials for each band. Either way, the antenna was designed with the highest radiation resistance and lowest conductor losses possible so that efficiency would be maximized.

Theory predicts the radiation resistance of a one-third size vertical antenna to be approximately 3 ohms. By using linear loading—as opposed to base loading—along with a capacitance hat for top loading, a more uniform current distribution is obtained along the length of the antenna, yielding a higher radiation resistance. The use of a capacitance hat will also lower the Q of the antenna, providing a wider bandwidth. Additionally, less helical conductor length is required, resulting in lower resistance losses. The use of large diameter #8 copper wire for the helical conductor further contributes to the wide bandwidth and low resistance losses of this antenna. The result is a measured feedpoint resistance of 40 ohms; radiation resistance is probably about half that value, the difference coming from ground losses, as my installation dictated four radials at a height of only 20 feet. A radiation resistance of 20 ohms is nonetheless an excellent figure for a radiator only one-third full size.

The helical portion of the antenna is used for the 20 meter band only. A trap constructed of coaxial cable is used above the helical portion, and a length of half inch copper pipe is used to add 30 meter operation. Therefore, on 30 meters the antenna is not comprised completely of a helical radiator, thus adding to its performance. The copper pipe has the additional benefit of adding top loading to the 20 meter section due to coupling with the capacitance hat; this further improves the performance of the 20 meter helical antenna.

A coaxial trap was used to electrically separate the 20 and 30 meter sections. Recent research and experimentation with traps constructed from coaxial cable

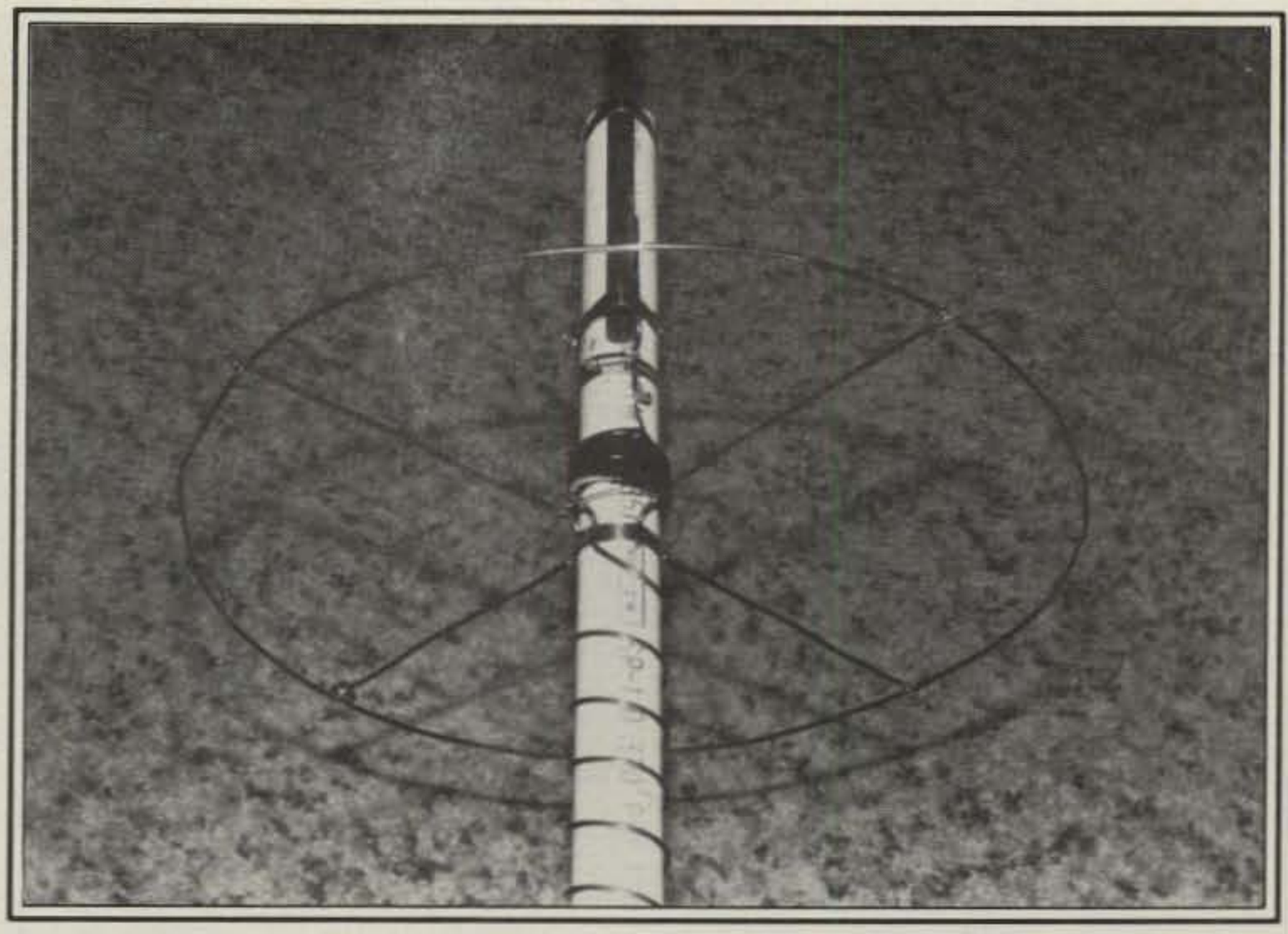
*506 Sugarland Run Dr., Sterling, VA 22170

has yielded the optimum diameter to be used, which in turn optimizes performance by minimizing cable length, weight, and losses.[4] Traps constructed in this manner are inexpensive, easy to construct, broadband, and quite stable. They can also operate at fairly high levels of power. In my example RG-58/U coaxial cable was used, which should be able to take the full legal limit of power. The smaller RG-174/U type coax may also be used for power levels up to about 500 watts average output. The reader is directed to the article by Sommer for details on winding traps with this type of coax. Whichever type of coax is selected, be sure to obtain true RG-58/U or RG-174/U type cable; capacitance per foot and outer diameter are critical, and substitutes should be avoided. The values for RG-58/U type cable are 28.5 pF per foot with an outer diameter of 0.2 inches. Foam dielectric coax must not be used, as these values are not the same as for polyethylene dielectric.

As mentioned previously, this antenna may be installed at ground level with an extensive radial system, or as an elevated ground-plane antenna. Construction will be the same in both instances. However, tuning of the antenna will be required depending on where the antenna will be located. In either case, start construction of the antenna by cutting the PVC pipe to its desired size. The antenna portion of the PVC pipe takes up about 6 feet, so the pipe should be cut to that length, plus any additional amount required for mounting in your particular installation. Note that the antenna portion may be longer than 6 feet; final tuning will correct for any differences in helical conductor length, and performance will improve. This portion should not be reduced to less than 6 feet, however, as radiation resistance and bandwidth will decrease to smaller values. A size reduction of one third seems to be optimum.

Start by winding 33 feet of #8 solid copper wire on a clean section of 1¼ inch PVC pipe (my piece of PVC pipe was very dirty as purchased—taking a few minutes to wash the pipe with soapy water not only makes working with the pipe easier, but will ensure that any varnish or paint applied to the finished product will adhere properly). Adjust the coil to position it properly on the PVC pipe and make the spacing between turns as equal as possible. Fasten the coil in place with two hose clamps so they are snug; do not tighten down hard yet. Using the top hose clamp and 8 inch lengths of #8 wire, fashion four spokes at the top of the helical coil. With another piece of #8 wire, form a rim around the ends of the spokes.

Smaller wire, such as #20, may be used to lash the rim to the spokes so that they may be held in place for soldering. Using the smaller wire, form a ring around the base of the spokes, about 1 inch out from the PVC pipe, to join the four spokes together with the top of the helical conductor (see photo). Solder all connections, being careful not to use too much heat for too long as the copper wire may melt into the PVC pipe. Tighten to top hose clamp securely (leave the bottom clamp snug for tuning).



A view of the completed capacitance hat, coaxial trap, and antenna construction.

The coaxial cable trap is very easy to construct. Take 41 inches of RG-58/U cable and remove about 3 inches of outer jacket from each end, leaving 35 inches of unstripped cable. Pull the inner conductor out of the shield at both ends so that 35½ inches of shielded cable remains intact. The 35½ inch length is critical, as is the type of cable used. As mentioned previously, only true RG-58/U type cable should be used. Wind the length of coax onto the PVC pipe just above the capacitance hat. Use a good quality electrical tape to hold the turns in place. Trim and strip the inner conductor from one end so that it may be joined with the outer braid from the other end of the coil, and solder them together. Now tape the entire trap in place so that the turns are held closely spaced together. Solder the remaining lead at the bottom of the coil to the capacitance hat, and the top lead to a short length of #8 copper wire (see fig. 1). This copper wire should be held in place with a hose clamp and formed to make contact with the bottom portion of the copper pipe.

The copper pipe is a 34 inch long section of ½ inch pipe obtainable at most hardware stores. For my antenna an end cap was also purchased and soldered in place on the top end to keep out rain and moisture. Lightly sanding the pipe with fine sandpaper before mounting is a good idea so that paint or varnish applied later will adhere properly. Mount the copper pipe to the PVC pipe with two hose clamps, the bottom clamp also holding the #8 copper wire coming up from the trap firmly in place (see fig. 2). Do not solder the wire to the pipe yet, as some fine-tuning may be desired.

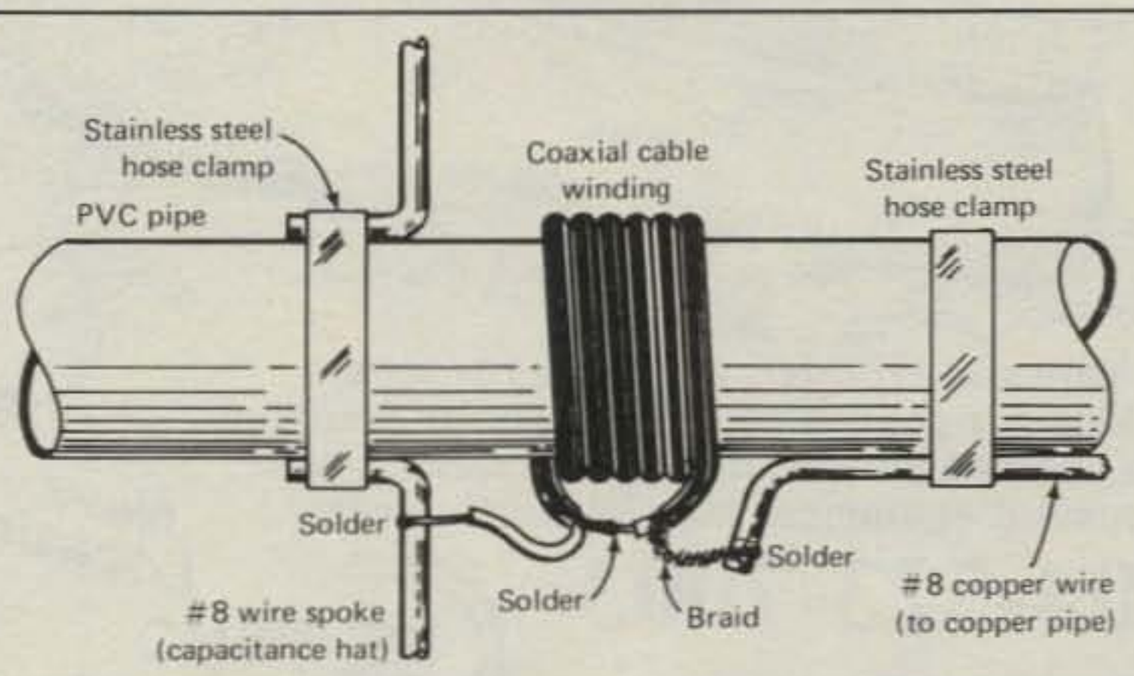


Fig. 1– Details of the coaxial cable trap and connections to the capacitance hat and copper pipe.

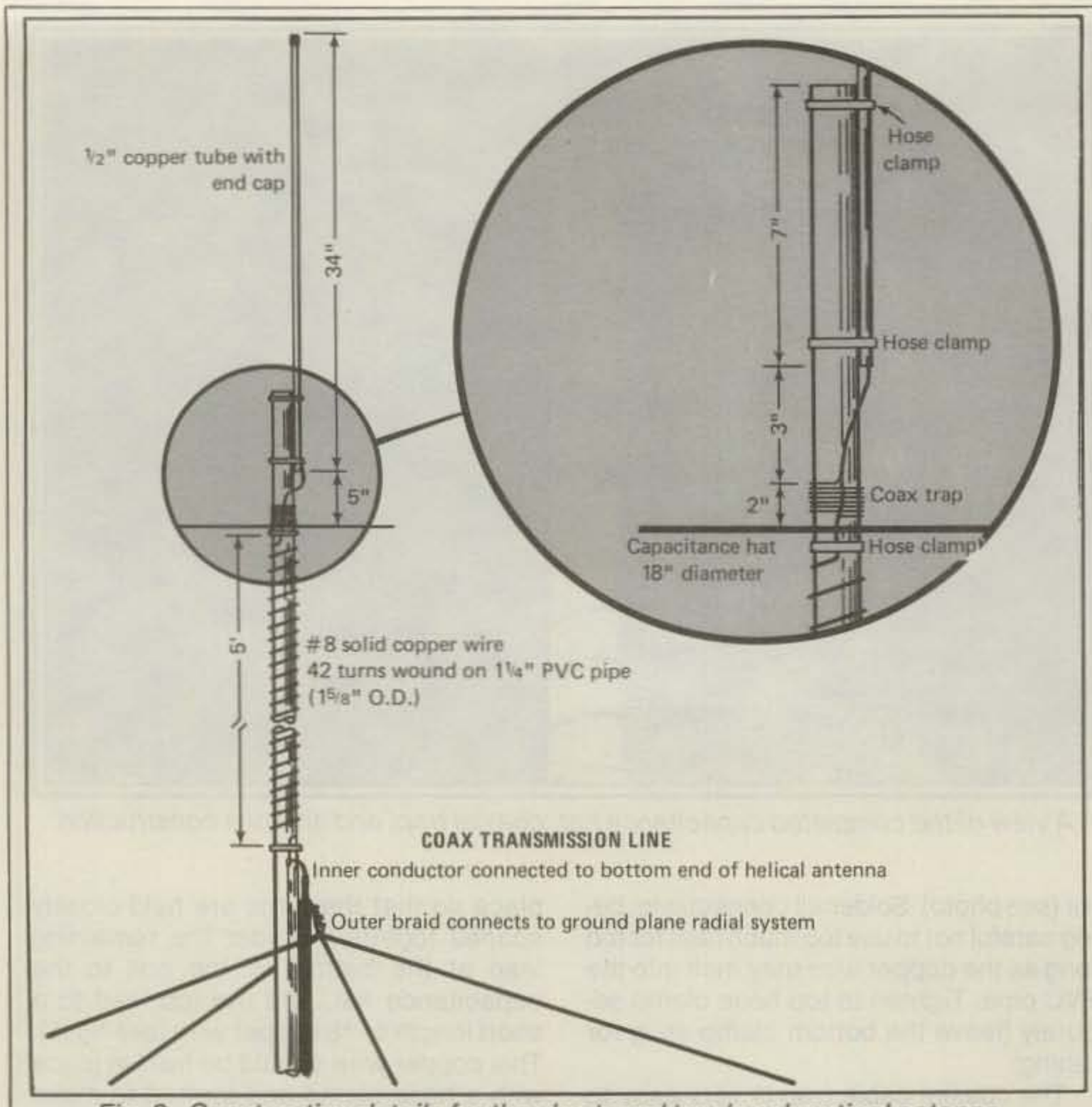
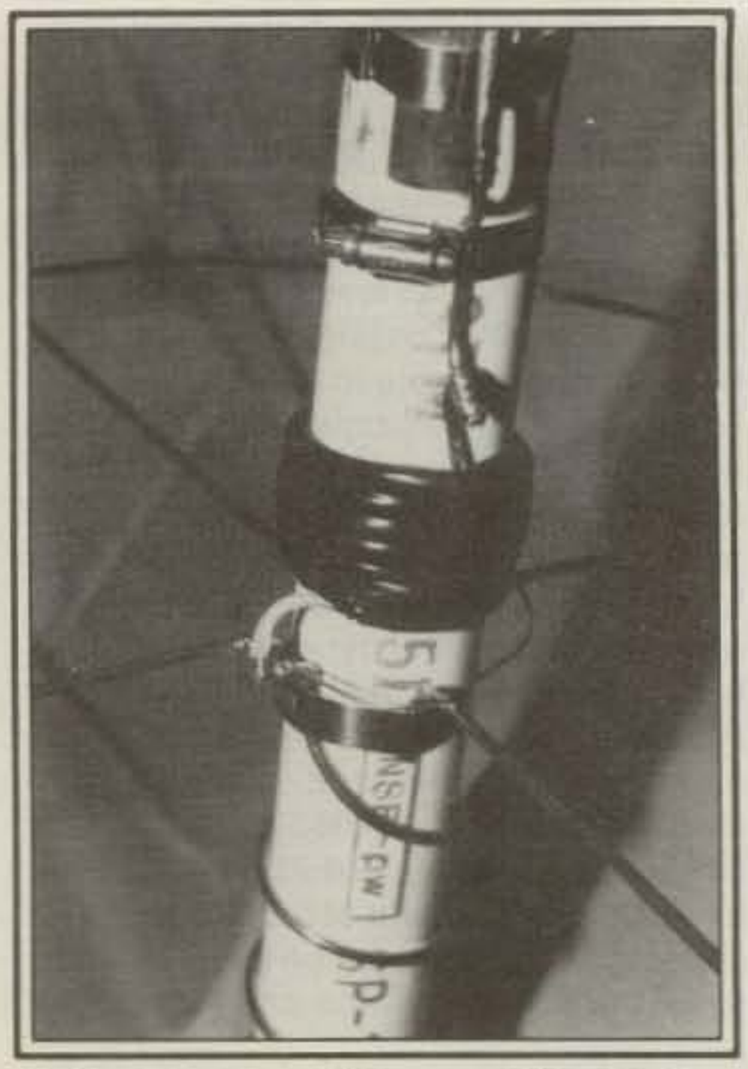


Fig. 2– Construction details for the shortened two-band vertical antenna.



A close-up view of the coaxial cable trap showing the connections to the capacitance hat and the 30 meter section.

To tune the antenna, it must first be mounted in its final configuration, whether that be ground or roof mounted. Start by tuning the 20 meter portion using a noise bridge or SWR bridge. If a noise bridge is used, it would be wise to feed the antenna with a length of coax cut to an electrical half wavelength at 14 MHz. By doing so, the readings obtained with the noise bridge will be indicative of the impedance at the antenna's feed point; otherwise, a Smith chart must be used to obtain the antenna impedance. Whichever device is used to tune the antenna, turns will no doubt need to be removed from the bottom of the helical portion until resonance is reached. Starting with 33 feet of helical conductor, I had to remove roughly 10 feet of wire before resonance was found. Although this is tedious work, it was nonetheless nice to know that less wire was needed than normally predicted for a short helical antenna of this type, indicating the effectiveness of top loading. When turns are removed from the bottom of the coil, it is necessary to pull the windings down so that the bottom end of the coil remains at the same spot. Resonance will be indicated by either minimum SWR or a reading of zero reactance on the noise bridge.

Once the 20 meter section has been tuned, slide the copper pipe up or down as necessary to tune the 30 meter section. As mentioned previously, some coupling does take place between the top and bottom sections so that some interaction will occur; however, the effect is slight. It is best to use an SWR bridge to tune this section, as the feedline will not be an electrical half wavelength at 10 MHz. The readings will be in the ballpark once tuning of the 20 meter section has been completed.

After both 20 and 30 meter sections are tuned properly, solder the #8 wire to the bottom of the copper pipe and ensure that all hose clamps are tight (some clamps may need tightening after soldering, as the copper wire may have melted slightly into the PVC. When all connections are tight and sound, give the helical coil, capacitance hat, and the copper pipe two coats of spar varnish or suitable paint. Once the varnish or paint has dried, weatherproof the trap and all connections with a silicone rubber sealant. Do not forget to plug the bottom of the copper pipe with the sealant to keep out moisture. I used a white interior/exterior epoxy paint and white sealant for an excellent protective finish and unobtrusive appearance.

The antenna was tuned for the middle of the 20 and 30 meter bands. Four 17 foot radials and four 24 foot radials were run out from the base of the antenna along the rooftop of my house. A feedpoint impedance of 40 ± j0 ohms was measured at 14.200 and 10.125 MHz; SWR measured less than 2:0:1 across the entire 20 meter band, bottoming out at about 1:2:1 at reasonance for both 20 and 30 meters.

It was hoped that the high feedpoint resistance measured and wide bandwidth were an indication that my attempts to build an efficient short antenna were successful. I am happy to report that results on the bands proved this to be so. Signal reports have been good to excellent on both bands, and i have enjoyed many solid contacts despite poor conditions and various bouts with QRM on 20 meters. The antenna as described is self-supporting, having survived several windstorms with no guys required. Little detuning has been observed despite rain, snow, or a coating of ice. With careful attention to a ground system, this antenna will be an excellent performer in a small package.

List of Materials

10 feet 1¼ inch PVC pipe (O.D. approx. 1.7 inches).

50 feet #8 solid copper wire (available at electrical supply store).

34 inch copper pipe, ½ inch type.

1 end cap for above.

4 feet RG-58/U type coax (Radio Shack 276-1326 or equiv.).

5 stainless steel hose clamps, 1½ to 2½ inch.

Misc.: antenna mounting hardware, radial wire, electrical tape, spar varnish or paint, silicone sealant.

Footnotes

[1] J. Sevick, "The Ground-Image Vertical Antenna," *QST*, July 1971.

[2] R. Gorski, "Efficient Short Radiators," *QST*, April 1977.

[3] K.T. Thurber, Jr., "Antennas," *CQ*, February 1985, and D. Newcomb, "Notes on Ground Radial Systems."

[4] R. Sommer, "Optimizing Coaxial Cable Traps," *QST*, December 1984. CQ

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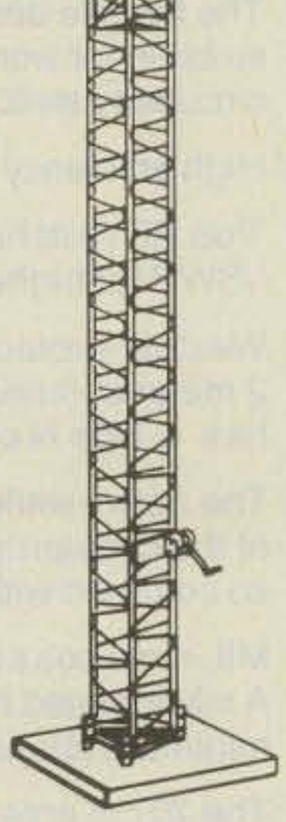

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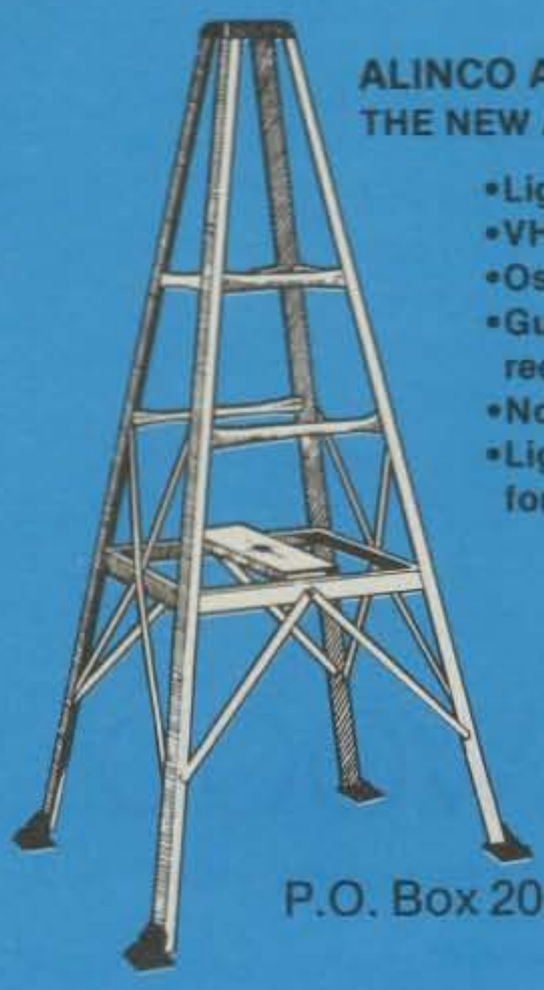

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A Loop Array For 160 Meters

BY RICHARD C. FENWICK*, K5RR

The Beverage antenna[1] has long been the antenna of choice where a unidirectional radiation pattern for 160 meter reception is required. However, most amateurs do not have the space for one Beverage antenna, let alone antennas to cover multiple directions. Also, a permanent Beverage antenna installed at the usually recommended height of 10 to 20 feet is not a trivial construction project.

I had gotten into the habit of erecting temporary Beverage antennas each winter and taking them down in the spring. However, this got to be a nuisance, so I decided to try a two-element end-fire loop array, an idea which first occurred to me 15 years ago. Such an array has a radiation pattern in azimuth similar to that of a 400 foot Beverage antenna.

The radiation pattern of the subject array is shown in fig. 1. This pattern is calculated by the process shown in fig. 2. This radiation pattern is obtained independent of frequency as long as the spacing between the loops is small in terms of wavelengths (a quarter wavelength or less). This raises the possibility of using the array on more than one band. More about this later.

An end-fire pattern from a two-element array requires that the two elements be fed with equal amplitude currents having a phase relationship of 180 degrees minus the element spacing in degrees. There are a number of ways one can go about accomplishing this. I am going to describe only the method I have successfully used, an approach which uses readily available materials and makes a nice project for a weekend.

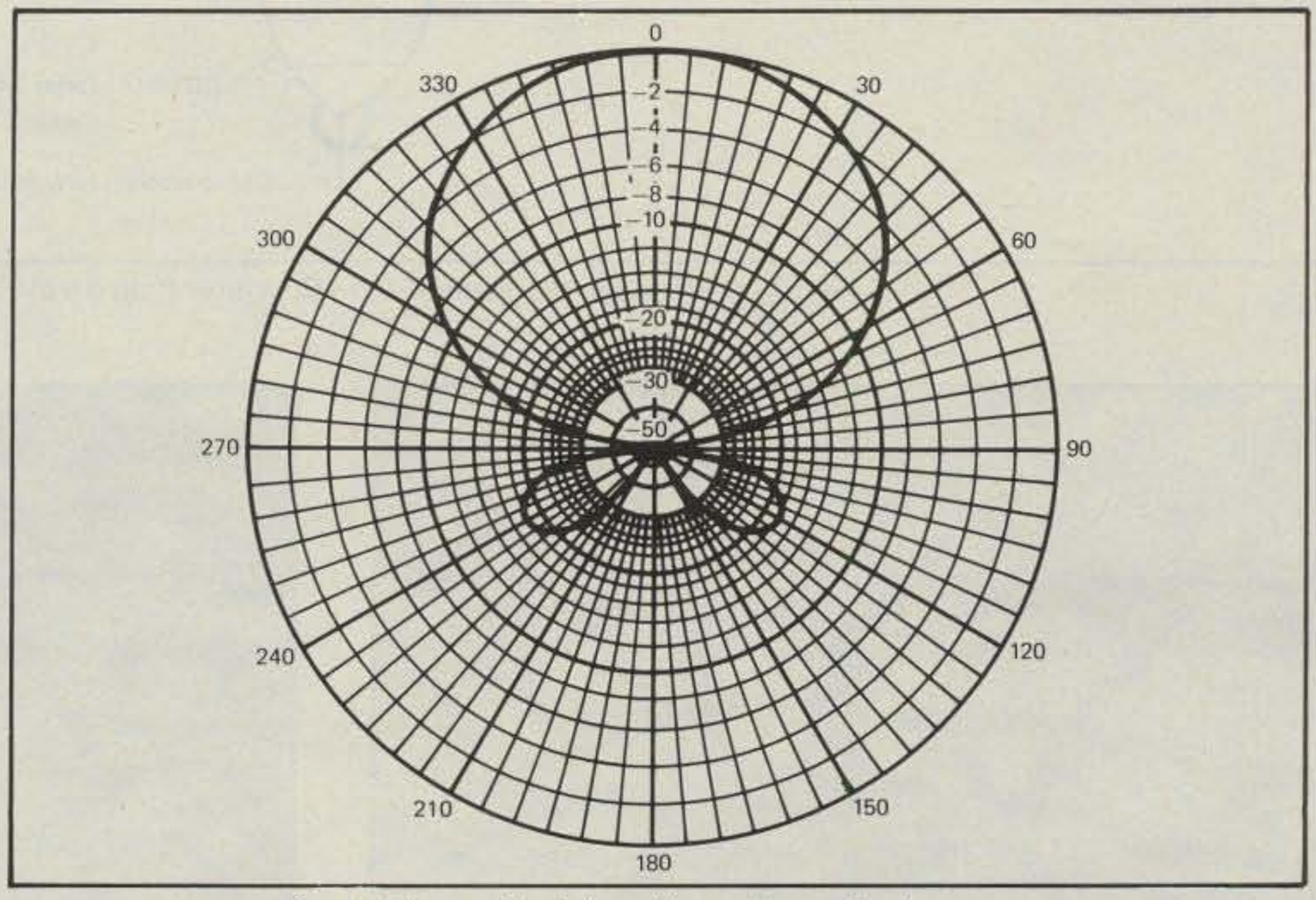

Fig. 1– Theoretical directive pattern of a loop array.

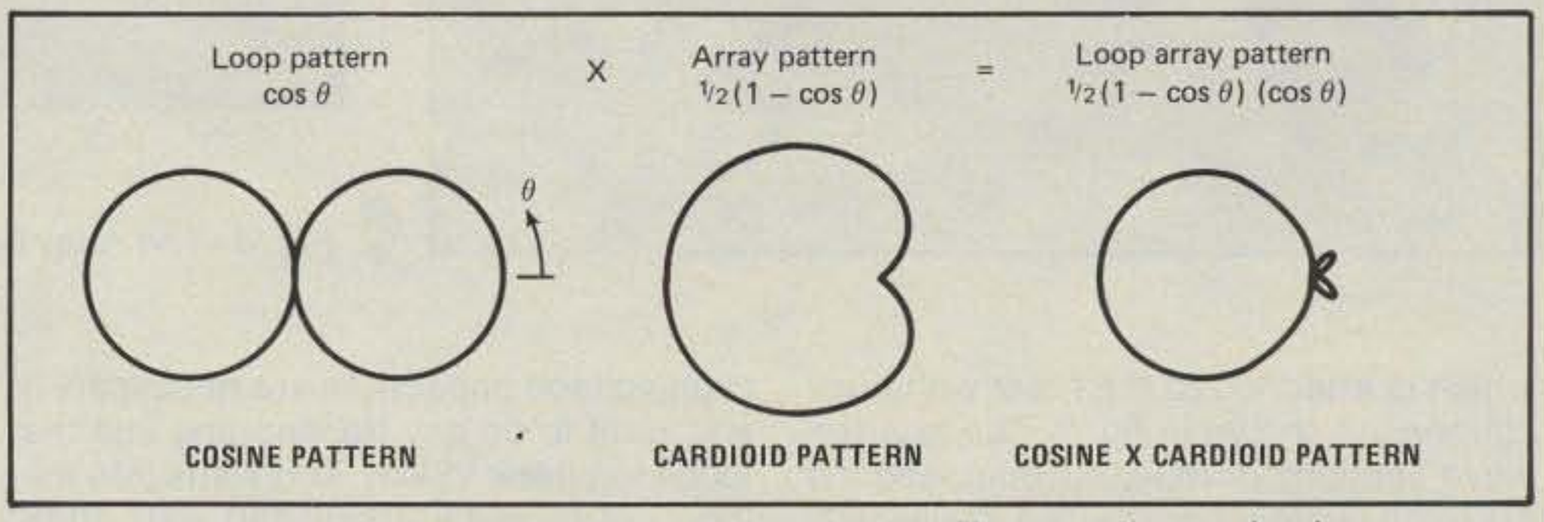

Fig. 2– Derivation of a loop array pattern (linear, voltage plots).

Construction Details

Fig. 3 shows the array in detail, along with the relay box (fig. 4) which has been incorporated to permit reversing the end-fire direction. Each loop is suspended from a central mast guyed with nylon cord and made of a standard 10 foot length of 1½ inch schedule 40 PVC pipe. Four quarter-inch diameter holes are drilled symmetrically around each end of the pipe, a half inch from the end (see figs. 5 and 6). Two of the bottom holes are used to attach the mast to a tilt-up base support bracket, in this case made of aluminum channel that happened to be available. Note that "link coupling" to the wire loop is used. Note especially the opposite orientation of the two coupling loops. This is how the required 180-degree shift between the two loop antennas is obtained.

The resonant input resistance of a loop is adjusted to 50 ohms by controlling the spacing between the coupling loop and the loop wire. The coupling loop is supported by a 3 foot length of ½ inch PVC pipe,

c/o Electrospace Systems, Inc., P.O. Box 831359, Richardson, TX 75083

[1]The ARRL Antenna Book, *14th edition, pp. 7–10.*

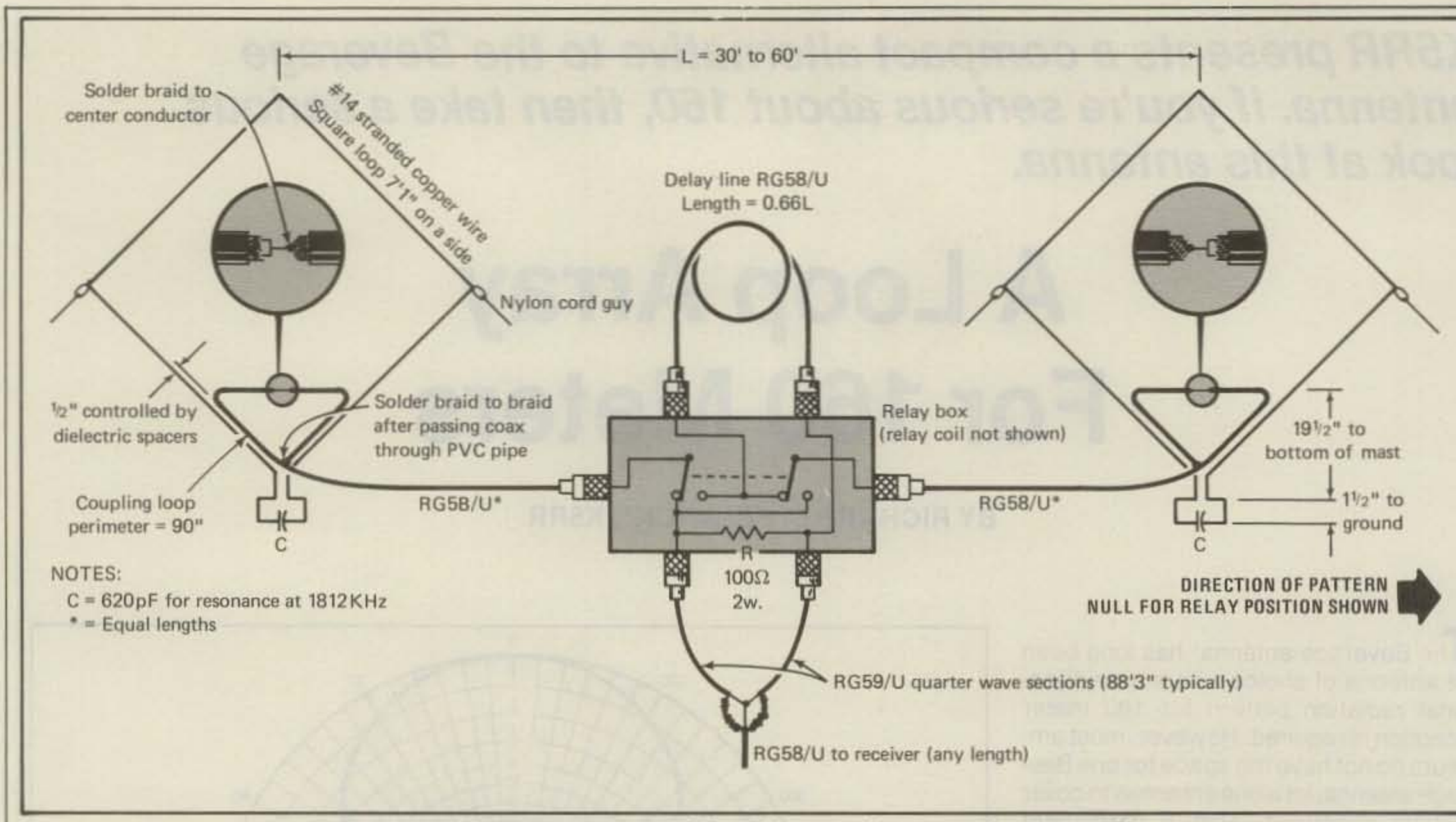

Fig. 3– Schematic diagram of the 160 meter loop array (not to scale).

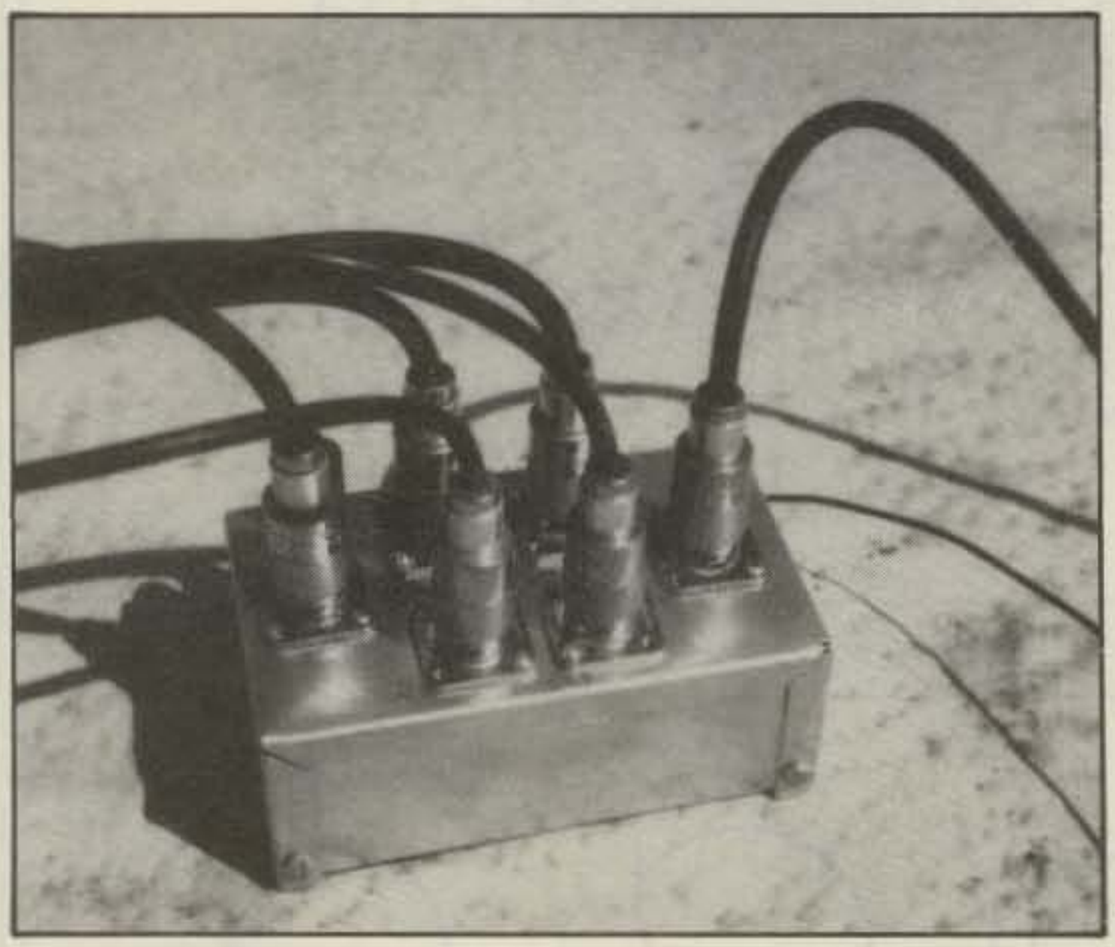

Fig. 4– The relay box.

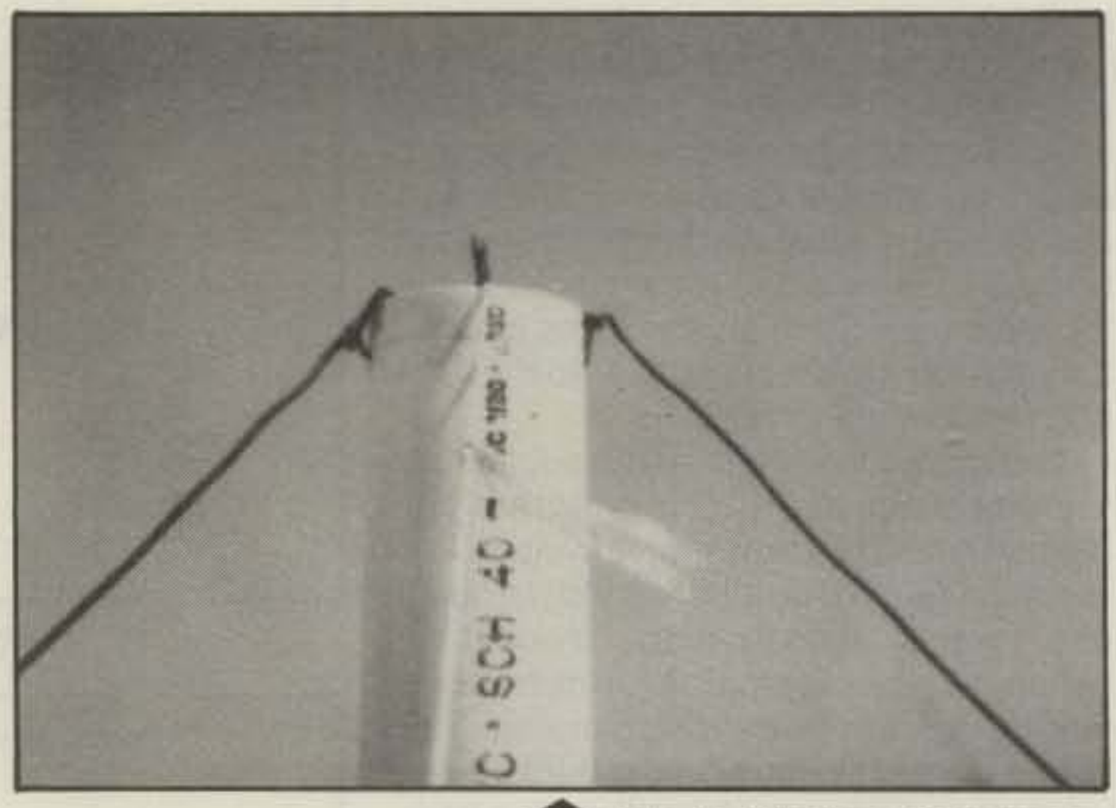

Fig. 5– The top of the mast.

which is attached to the mast with hose clamps, as shown in fig. 7. The quarter-wave sections of RG-59/U coax and the 100 ohm resistor constitute a "Wilkinson power divider," without which equal currents in the two loops could not be maintained except very near the resonant frequency of the loops. The delay line and quarter-wave lines should be made of coax with solid polyethylene dielectric so that there is no question of their electrical length.

The capacitors should be a good RF type, for example micas, ceramics, or air, such as "broadcast variables." I use Vitramon 2000 volt ceramic capacitors available from Surplus Sales of Nebraska. High-voltage capacitors are necessary if you want to do any transmitting into the loops to check VSWR. Ten watts into the loop will produce about 450 volts RMS across the capacitor.

Tune-Up Procedure

The loops have very narrow impedance bandwidth—only about 13 kHz for 2:1 VSWR! Fortunately, for receiving purposes the VSWR can be quite high, but the loops must be tuned to very nearly the same frequency, meaning that not only must they be constructed alike, but the capacitors must be very close in value. I have had good luck with the tolerance of Vitramon capacitors by buying a small assortment of, for example, 150 and 470 pF units and then matching them up to get two nominally 620 pF assemblies that are close to the same value (within a couple of pF). As an alternative, variable capacitors can be used, padded if necessary with fixed units. Resonance is obtained by adjusting the capacitor value to achieve minimum VSWR at the desired frequency. Dielectric shims taped in place between the wire loop and the coupling loop may have to be somewhat different than the ¼ inch thickness I used, depending on soil conductivity and exact height of the loop above ground. However, 1:1 VSWR at resonance is not an absolute requirement. I

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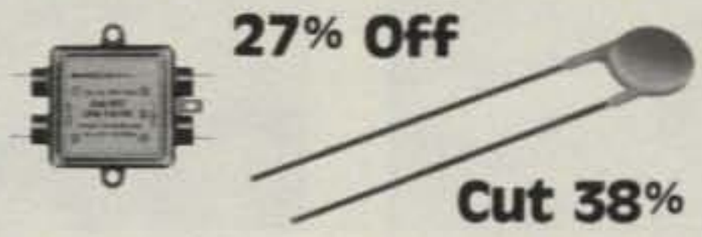

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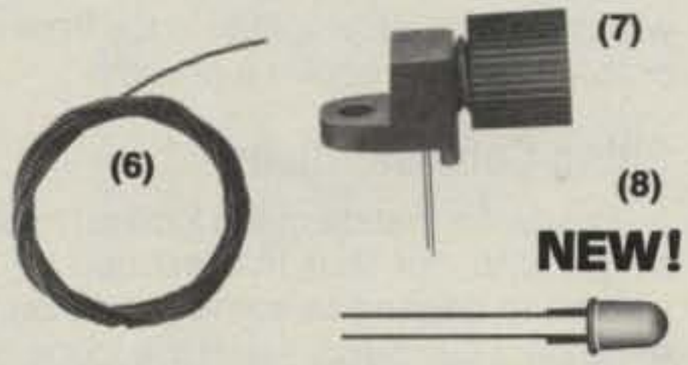

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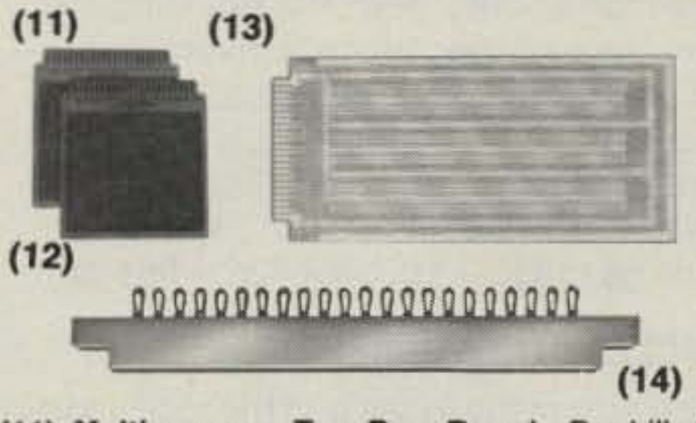

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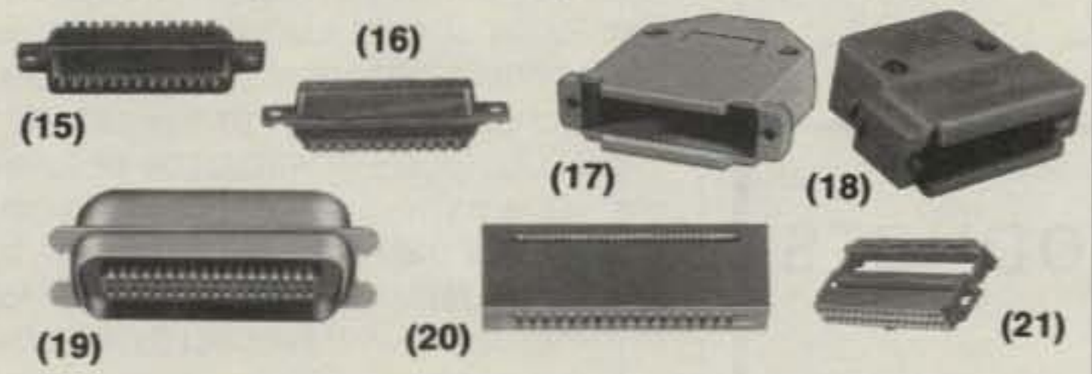

Fig.	Description	Positions	Cat. No.	Each
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17	Hood for Above	25	276-1549	1.99
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19	Parallel Printer Connector	36	276-1534	4.99
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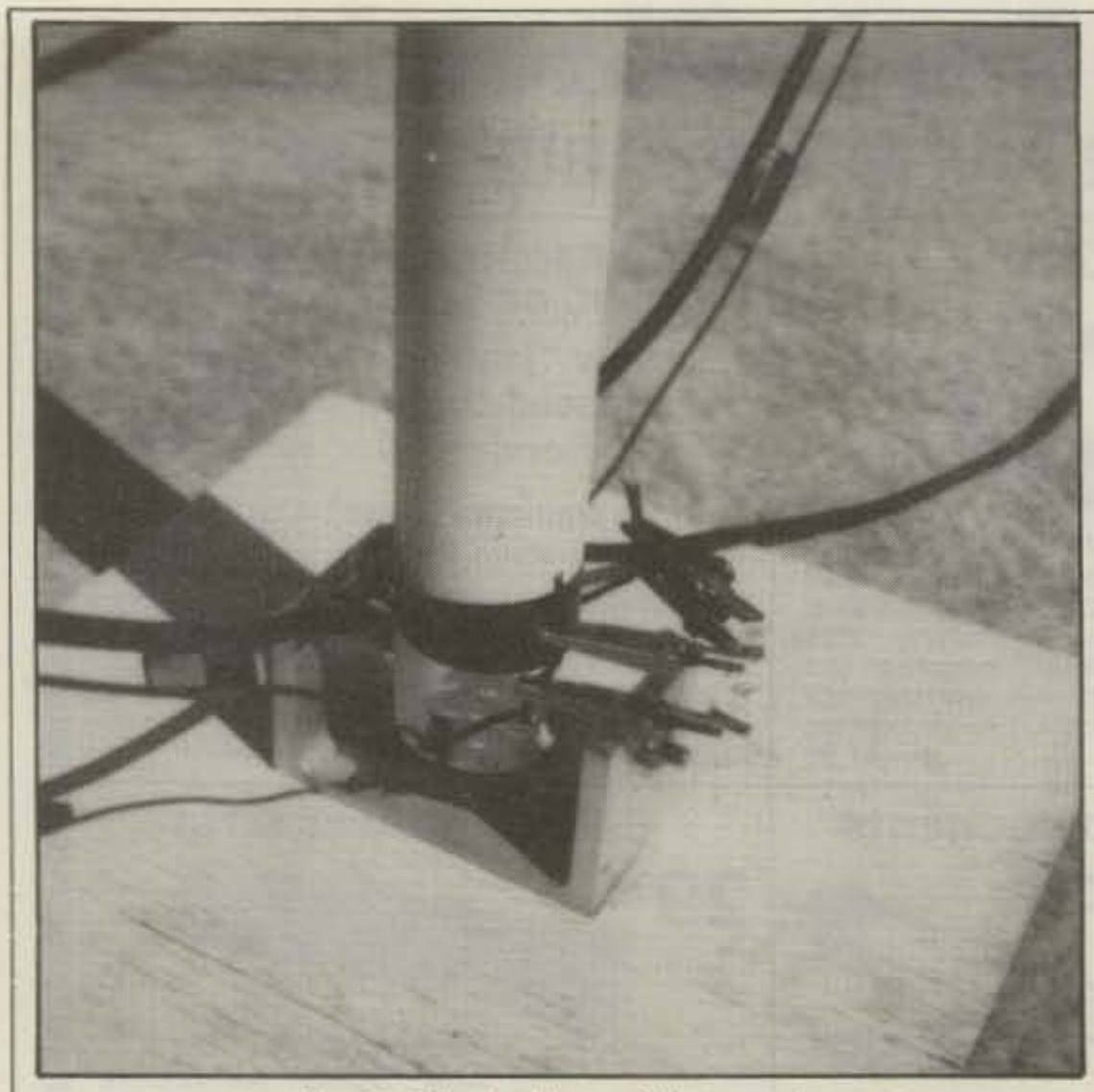


Fig. 6– The bottom of the mast.

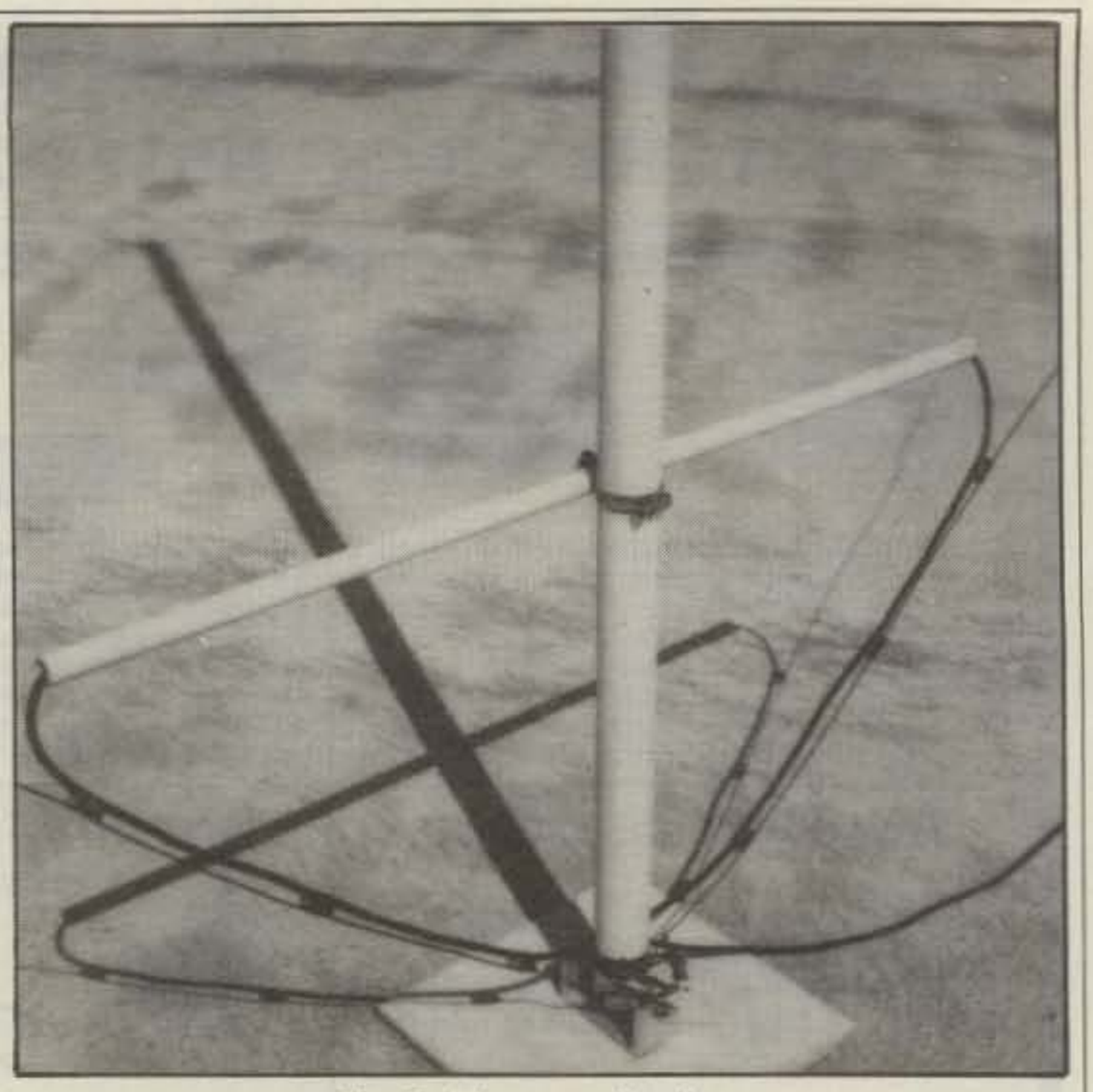


Fig. 7– The coupling loop.

have been satisfied when I got it down to about 1.5:1. I recommend that the resonant frequency of the two loops not differ by more than about 2 kHz. Recognizing that the required capacitance is inversely proportional to frequency squared, the values of capacitance required for any frequency can be readily determined. (Example: For 1900 kHz resonance the capacitance would be $(1812 \div 1900)^2 \times 620 = 564$ pF.)

Effect of Array Dimensions

The size of the loops and the loop spacing "L" both affect the efficiency of the array. Much smaller loops and much closer spacing could be used; the same antenna patterns would be obtained. The efficiency would soon become unacceptably low, though. What is acceptable efficiency? This depends on a number of factors: the sensitivity of your receiver, the typical atmospheric and man-made noise levels at your QTH, and the bandwidth over which the antenna is to be used. A loop spacing of 60 feet and the loops as shown yield an efficiency of about −29 dB at the resonant frequency, relative to a perfect, short vertical radiator. This will be acceptable in many instances. This also happens to be about the same efficiency I have observed with Beverage antennas over Dallas's high conductivity soil. (Beverage antenna efficiency improves over low conductivity soil.) If you find that you cannot hear an increase in receiver noise when the antenna is connected, the efficiency is insufficient for your receiver or QTH, in which case I recommend the use of a preamplifier ahead of the receiver. Loop spacings greater than 60 feet will gain little in sensitivity, but you theoretically lose about 6 dB if you reduce the spacing to 30 feet. A preamplifier will probably be required with most receivers at a spacing to 30 feet. I have found, though, that receivers vary widely in sensitivity on 160 meters. Those which have an RF amplifier in the front end probably won't require a preamp.

Siting Considerations

The performance of the loop array (or a single loop, for that matter) can be expected to depend to some extent on the antenna's surroundings. If the loops couple into a nearby resonant tower or other transmitter antenna, for example, the patterns of the array, especially the null depths, will likely be degraded. The same goes for the effect of house wiring, powerpole ground wires, etc., but to a lesser extent than in the case of resonant structures. For this reason, the loops should be sited as far from such objects as possible. The loops should also be oriented such that nearby resonant structures, insofar as is practicable, are off to the side of the loops. Obviously, it will not be possible to place the pattern null of both loops in the direction of the resonant structure, but it should be possible to position the loops symmetrically with respect to the offending radiator.

Measured Characteristics

Fig. 8 shows the measured VSWR of a single loop. These were measured with a Daiwa CN-720B VSWR meter. The VSWR of the array is a good check on integrity of the installation; it minimizes at very nearly the same frequency as the individual loops (within 1 kHz, typically) and the VSWR is slightly lower than that of the individual loops. It appears to be normal for

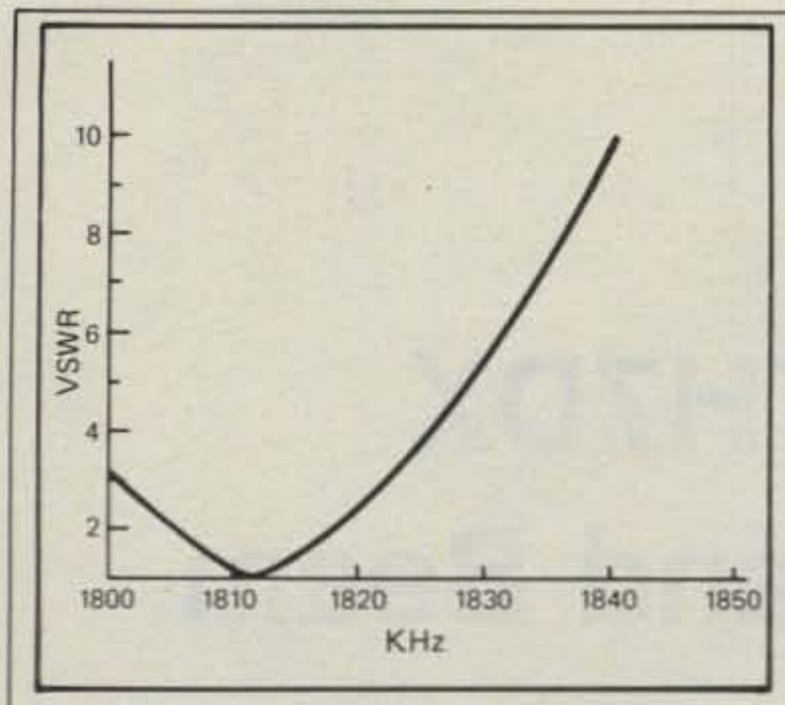


Fig. 8– Measured VSWR of a single loop.

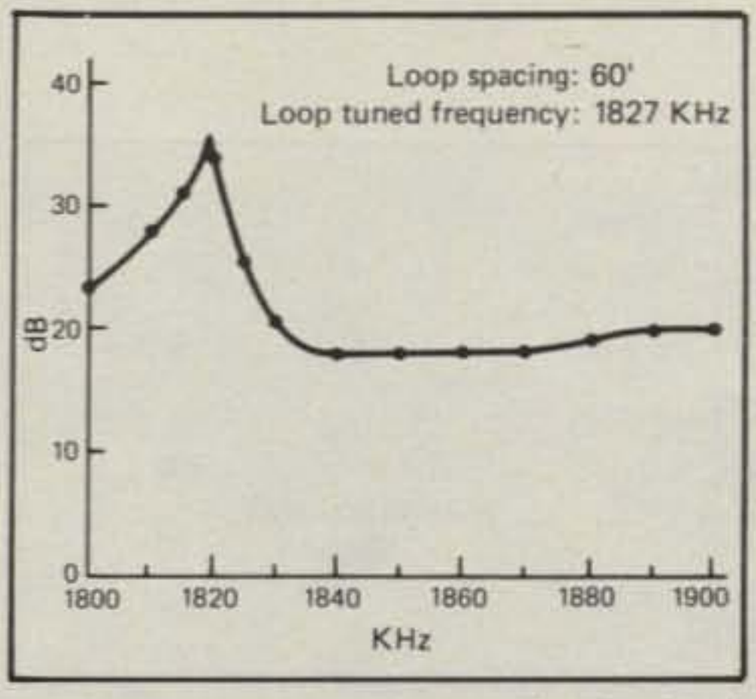


Fig. 9– The measured front-to-back ratio of a loop array.

the VSWR to differ slightly from one switched beam direction to the other. VSWR's of 4:1 and 10:1 correspond to reductions in array efficiency of 2 dB and 5 dB, respectively. I suggest that relays be installed at each loop to switch in different capacitor values if the array is to be used over the entire 160 meter band.

Fig. 9 shows the measured front-to-back ratio as a function of frequency. The loops in this case were tuned to nominally 1827 kHz and spaced 60 feet apart. VSWR of the individual loops at resonance was about 1.5:1. I believe that these measurements are accurate to within 2 dB. The transmitting antenna for these measurements was located about 500 feet away from the array. The exact tuning and matching of the loops and the length of the quarter-wave lines (88 feet 3 inches in this case) presumably have some effect on the front-to-back behavior. The array environment probably also has an effect. For these measurements the array was located on a large metal roof.

The loop array would not be expected to exhibit much directivity for signals arriving at high angles above the horizon. Nonetheless, the array has exhibited usable front-to-back ratios on sky-wave signals originating at relatively close distances, like a few hundred miles and, of course, higher front-to-back ratios on signals originating at greater distances. The rejection of local signals provided by the array is especially welcome and is inherently greater than will be observed on sky-wave signals.

Multi-Band Operation

The loop array has also been tested on 80 meters, with excellent results. Even with 30 foot loop spacing the efficiency is more than adequate without a preamplifier—about –16 dB. It would be a relatively simple matter to incorporate relays into the array such that the loop tuning capacitors and the quarter-wave sections of RG-59/U would be remotely band-switched, permitting operation on 160 meters and 80 meters (and even 40 meters, if the loop spacing is held to 35 feet or less).

Current Work

For the 1985–1986 winter season I planned to have three 160 meter loop arrays in operation, switchable NE/SW, E/W, and SE/NW. Also, arrays of loop arrays were to be tried. A broadside array of two loop arrays, spaced on the order of ¾ wavelength, is of interest for reception toward Europe and Japan. Such an array would have a 3 dB beamwidth of about 40 degrees. (A Beverage antenna would have to be about 3 wavelengths long for 40 degree beamwidth.) Beyond this, I run out of space. On 160 meters the antennas you have are never big enough. There are more signals in there, if you could just hear them! CQ

CQ REVIEWS:

The Telex/Hy-Gain TH7DX Super Thunderbird Triband Beam

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The Telex/Hy-Gain TH7DX Broadband Super Thunderbird beam is one of five or so "super"-size triband beams on the market if one classifies a "super"-size tribander as having more than 5 elements, a boom length of over 20 feet, and a weight of over 50 lbs. So after having used and reviewed various smaller beams, it was very interesting and informative to investigate the much acclaimed TH7DX.

One point, however, that might be touched upon right away is whether an operator should be interested in a large-size triband beam over a simple tribander. The large-size beam is more conspicuous, may require heftier support and a more heavy-duty rotator, and naturally will cost more. Interestingly enough, the forward dB gain figures for small triband beams (e.g., 3 elements on a 16 foot boom) versus a very large tribander (e.g., 6 elements on a 32 foot boom) are not all that dramatically different. The smaller beam will generally run only 1.8 to 2.5 dB less in forward gain. However, all of the amateurs to whom I have ever spoken who went from smaller to larger beams would only go back to a smaller beam with extremely great reluctance. It seems that the combination of generally greater forward gain, better front-to-back ratio, broader bandwidth, and less noise pickup rapidly add up to a station having a large beam coming out on top of the DX pileups or propagating longer while other stations fade out over DX paths.

Electrical			
Frequencies of Operation	**20m**	**15m**	**10m**
Under 2:1 VSWR (MHz)	14.0–14.35	21.0–21.45	28.0–29.7
Under 1.5:1 VSWR (MHz)	14.07–14.33	21.18–21.45	28.6–29.6
Front-to-Back Ratio (dB)	22 ±5	22 ±5	18 ±5
Average Half-Power Beamwidth (deg)	66	63	63
Maximum Gain (dBi)	8.0	8.7	9.6
Maximum Power		Maximum Legal	
Lightning Protection		DC Ground	

Mechanical	
Boom Length	24 feet (7.32 m) (guy support supplied)
Boom Diameter	2 inches (5.1 cm)
Longest Element	31 feet (9.45 m)
Longest Driven Element (one-half total length)	20 m—.185 wavelength 15 m—.203 wavelength 10 m—.225 wavelength
Turning Radius	20 feet (6.10 m)
Accepts Mast	1⅜" to 2½" O.D. (4.1 cm to 6.4 cm)
Net Weight	75 lbs. (34.0 kg)
Maximum Wind Survival	100 mph (161.0 kmph)
Wind Surface Area	9.4 sq. ft. (0.87 m²)
Wind Load at 80 mph	240 lbs. (108.8 kg)
Element Compression Clamps	T304 stainless steel, passivated
Hardware	stainless steel, except for boom-to-mast bolts
Suitable Rotators	Hy-Gain HDR-300, Ham IV or T²X

Table I– Electrical and mechanical specifications for the TH7DX.

General

Table I lists the electrical and basic mechanical specifications for the TH7. The specifications can present a lot of information if one studies them carefully, but the electrical specifications, as it turns out later, especially proved to be very conservative. Generally, however, the TH7 presents itself as a modestly large triband 20/15/10 meter beam having gain and bandwidth characteristics superior to a 3-element beam while presenting only reasonable increases in mechanical specifications (e.g., the turning radius is 20 feet, the wind surface area is 9.4 square feet, and the net weight is 75 lbs., while similar specifications for a 3-element beam might run 17 feet, 7.5 square feet, and 40–50 lbs.). The longest element length on the TH7 is 31 feet, while the boom length is 24 feet. It is a "big" antenna, but hardly what one would classify as a "monster"-size antenna.

Fig. 1 gives an overview of the design of the TH7. The figure is a bit detailed with all sorts of dimensions, since it is meant to be followed during assembly of the antenna, but nonetheless it does present the basic electrical design of the antenna. One might notice, first of all, that there are 2 driven elements with 4 traps each, which means that each driven element is active on 10, 15, and 20 meters. As it turns out, the dual driven element feature of the TH7 is rather unique, and it mainly accounts for the extremely good bandwidth exhibited by the antenna. If one looks up and down at the element configuration shown in fig. 1 and considers operation of the antenna on 20, 15, and 10 meters, one can appreciate the quite clever design features involved.

On 20 meters maximum advantage is taken of the total boom length by having the 20 meter director and reflector elements placed at the extreme ends of the boom. In conjunction with the driven elements, this means that the TH7 operates on 20 meters as a fairly wide-spaced, almost full element length, 3-element beam. In reality it performs much better than the "classic" 3-element, wide-spaced beam (¼ wavelength spac-

*c/o CQ Magazine

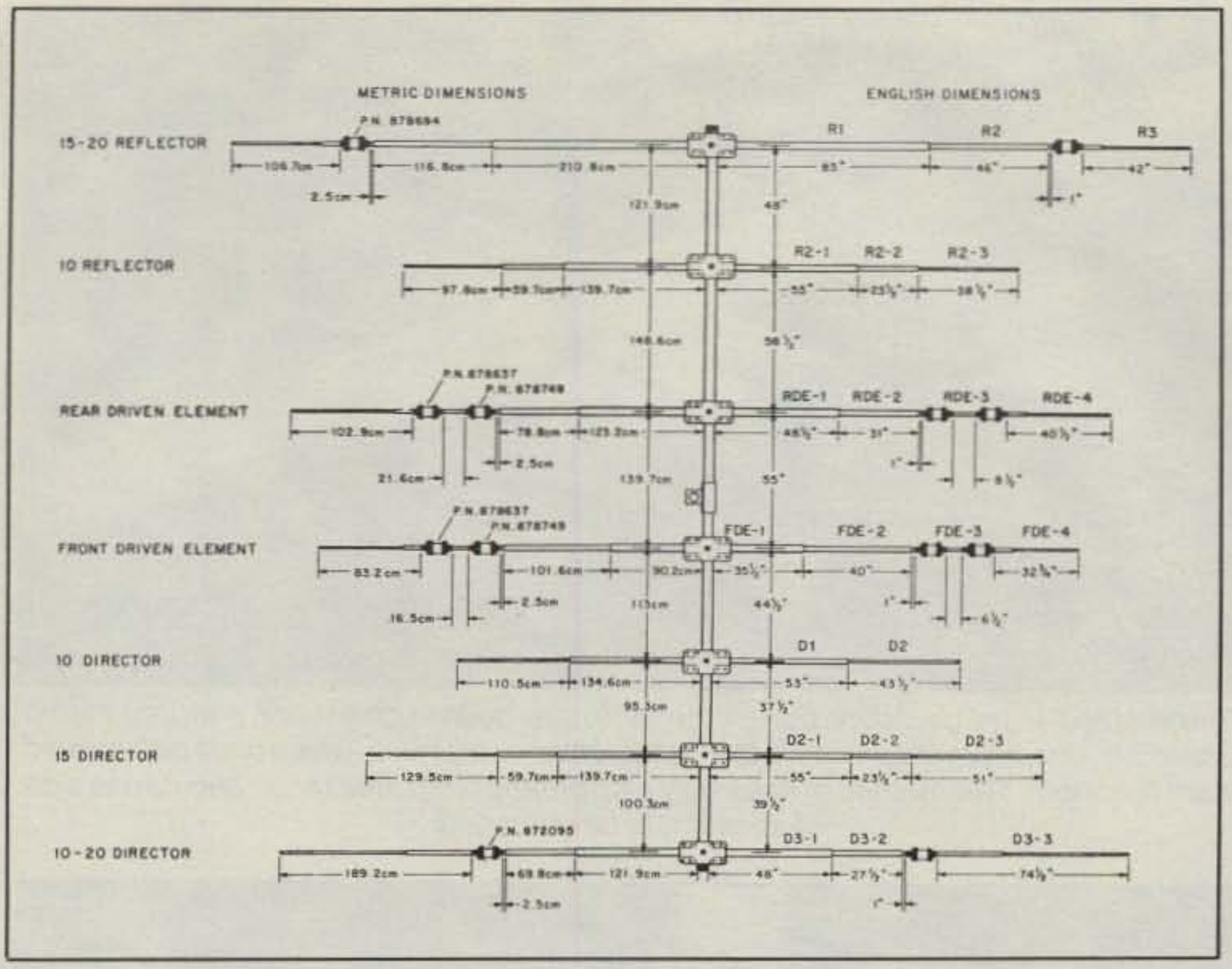
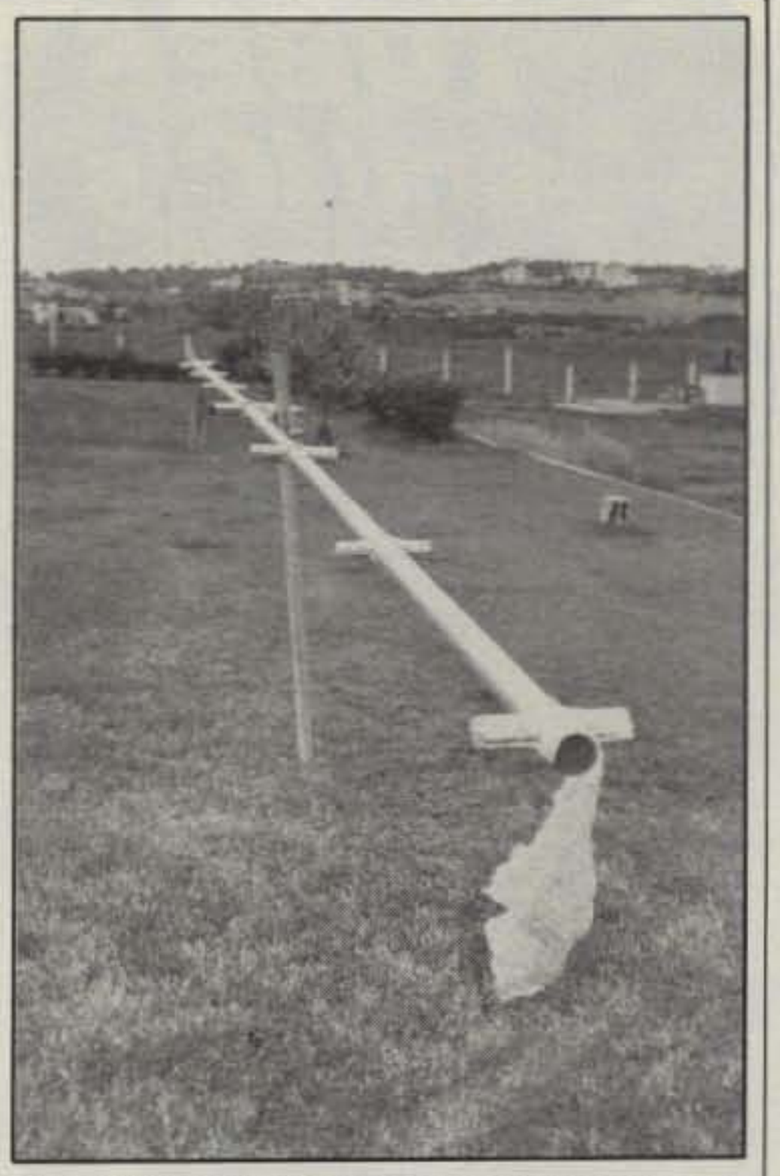


Fig. 1– Overall layout of the TH7.



The TH7 was assembled on a temporary mast. Just the boom is shown on the mast.

ing from driven element to both director and reflector elements) because its design has been computer optimized. On 15 meters the TH7 also operates as a wide-spaced, 3-element beam with dual driven elements, but the director element is a separate, dedicated element *without* any trap. The reflector element has a single trap to allow operation of it on both 15 and 20 meters. On 10 meters the TH7 becomes a 4-element beam with 2 director elements, 2 driven elements, and a reflector element. One of the director elements and the reflector element are dedicated elements without any traps. Overall the TH7 seems to be designed to maximize its performance parameters on a 24 foot boom, and that can only result in an optimized, 3-element, wide-spaced design on 20 and 15 meters and a full spaced 4-element design on 10 meters.

The broadband performance of the TH7 is due mainly to its dual driven element design, and the idea is illustrated in fig. 2. Phasing lines (tubes) are used to interconnect both the front and rear driven elements. The line has a crossover to produce a phase difference between the elements. The front driven element has connected to it a hairpin loop or Beta matching section, and the front driven element is connected to a ferrite balun transformer (supplied with the TH7) so the beam can be fed with any 50 ohm coaxial cable. Both driven elements are insulated from the boom, but the far end of the Beta match is grounded to the boom, so the feed terminals of the antenna are always at DC ground. Obviously, there is a complex relationship among the various reactance versus frequency changes that take place in the antenna's feed system. However, the

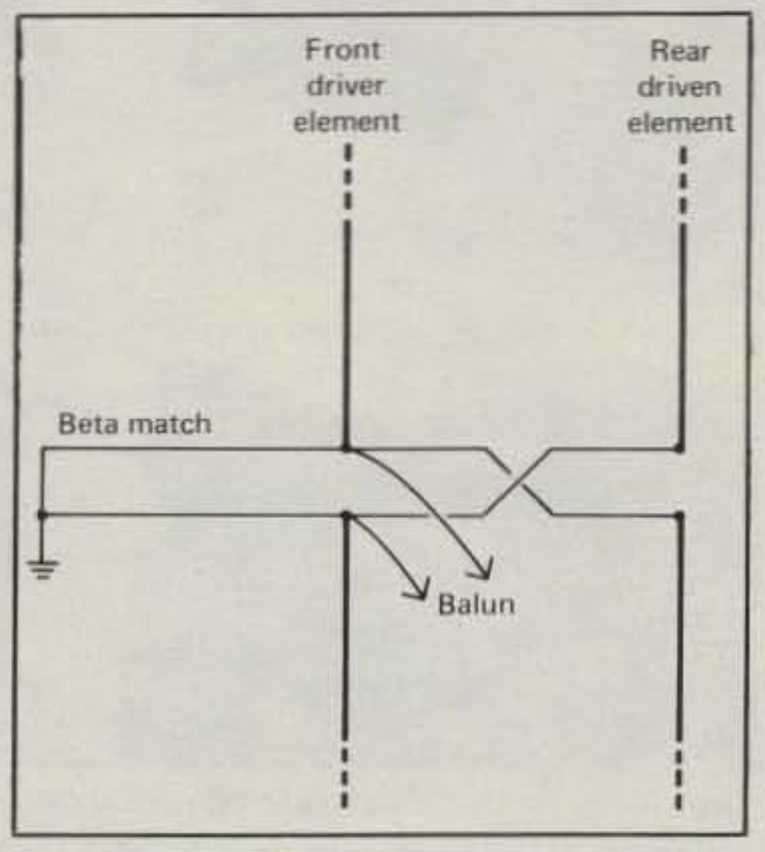


Fig. 2– The phasing and feedpoint matching system used in the TH7.

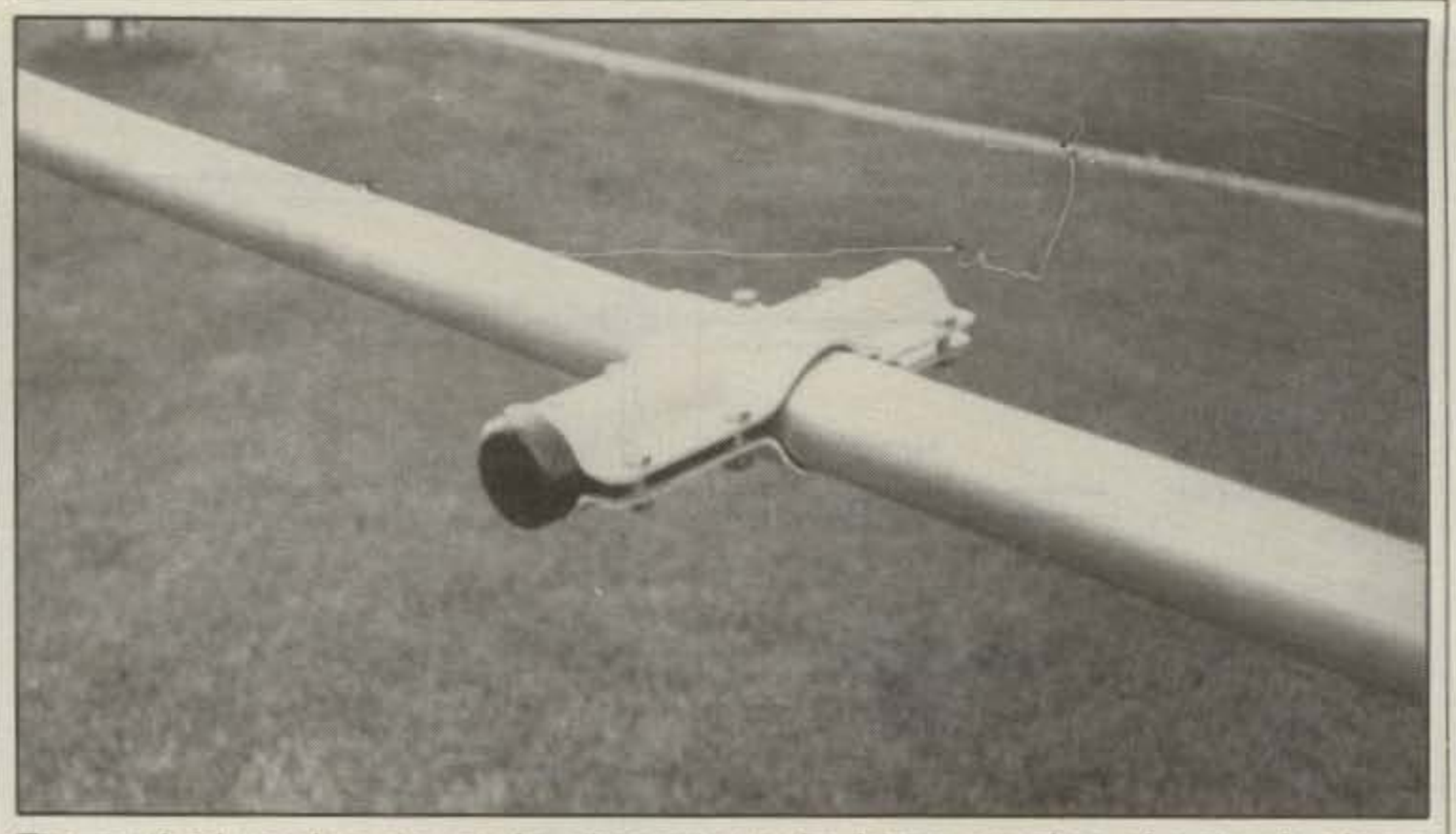
basic idea would seem to be that the reactance changes in one driven element move in an opposite direction from those taking place in the other driven element (due to the crossover in the phasing lines), thus producing a cancelling effect. The Beta match raises the feedpoint impedance to roughly 50 ohms (balanced) from the lower impedance produced by having the two driven elements fed in parallel. The balun, of course, converts the 50 ohms balanced feedpoint to 50 ohms unbalanced.

Assembly

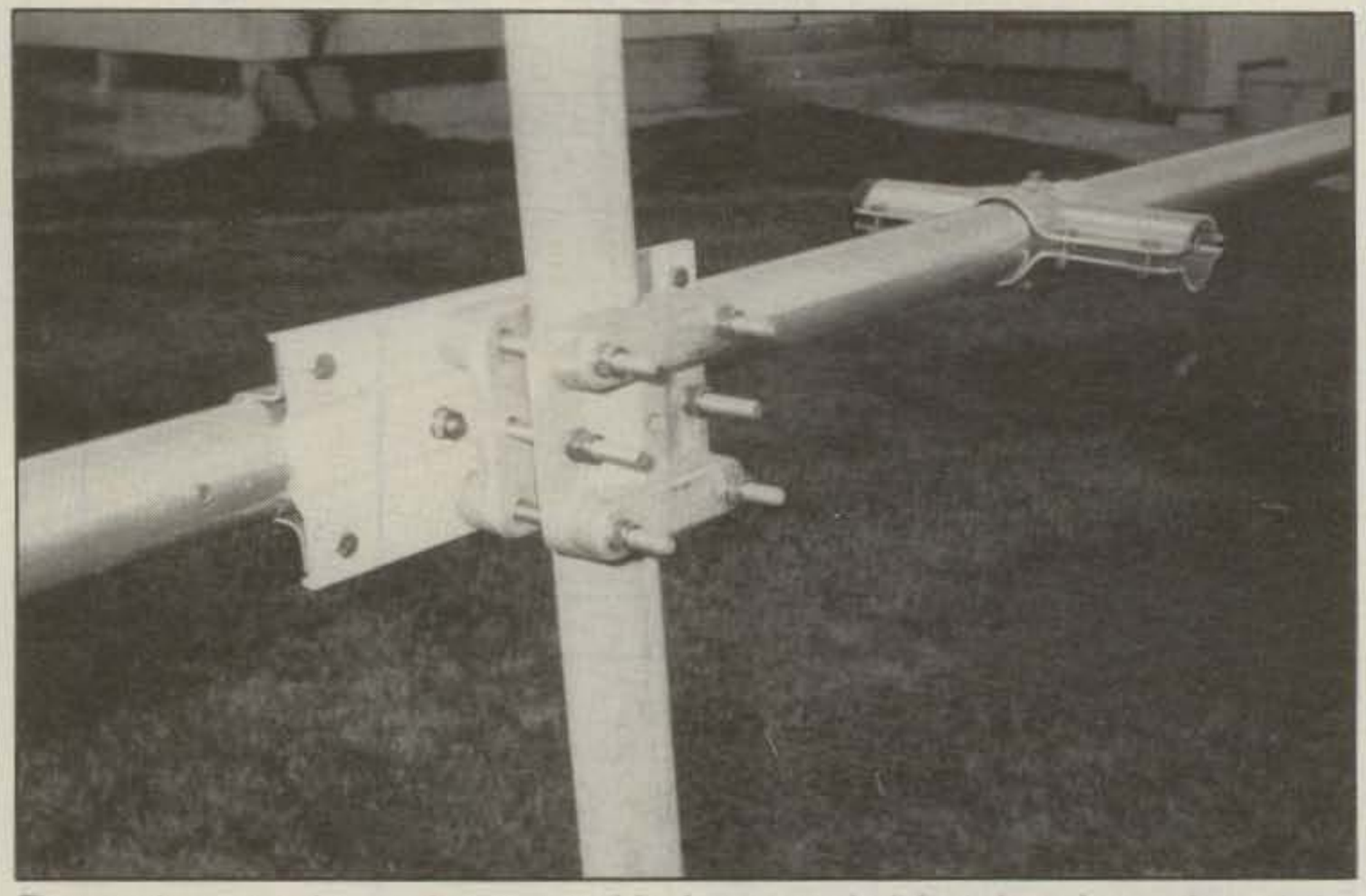
The TH7 consists of some 91 basic parts (or 700 if one counts every single bolt and lockwasher) ranging from all sorts of aluminum tubing to nuts, bolts, clamps, etc., down to the "finishing touch" of some Coax-Seal® so the coaxial line connection to the balun transformer can be properly weather protected. The 91 parts come packed in two shipping containers each measuring roughly 6 feet long by 6 inches square.

When one initially unpacks the two shipping containers, it seems that one is going to become overwhelmed by the number of parts involved. However, that is just an illusion, and it is quickly dispelled when one reads the assembly manual for the TH7. The manual is some 30 pages long, although about only 15 pages directly describe the assembly of the antenna. The manual is extremely well written and profusely illustrated with diagrams. Fig. 3 presents an example, although it is probably a bit unfair to present the diagram without its accompanying text. At least, one can note that the assembly diagram is extremely detailed and includes a complete reference to all the parts involved in the assembly. I found every point in the assembly manual for the TH7 to be very clearly covered. Only simple tools are needed to assemble the TH7—an adjustable 8 inch wrench, a few inch-size nut drivers, and a 12 foot tape measure.

I assembled the TH7 using a 10 foot pipe section driven about 3 feet in the ground as a temporary mast. I suppose one could put the antenna together in a few hours, but I took a very leisurely three days to do so, working just two or three hours each day. I would highly recommend this approach, if at all possible. As Telex/Hy-Gain mentions in the TH7 manual: "**The performance engineered into the TH7 is totally dependent on accurate assembly.**" I



The method used to mount the elements to the boom consists of a sturdy clamp assembly. Insulators are placed in the clamp for those elements which must be insulated from the boom. This method of assembly also greatly facilitates repair should one side of an element be damaged.



The sturdy mast-to-boom clamp assembly. A separate bolt (not shown) goes through the mast and the assembly to positively prevent the boom from slipping on the mast.

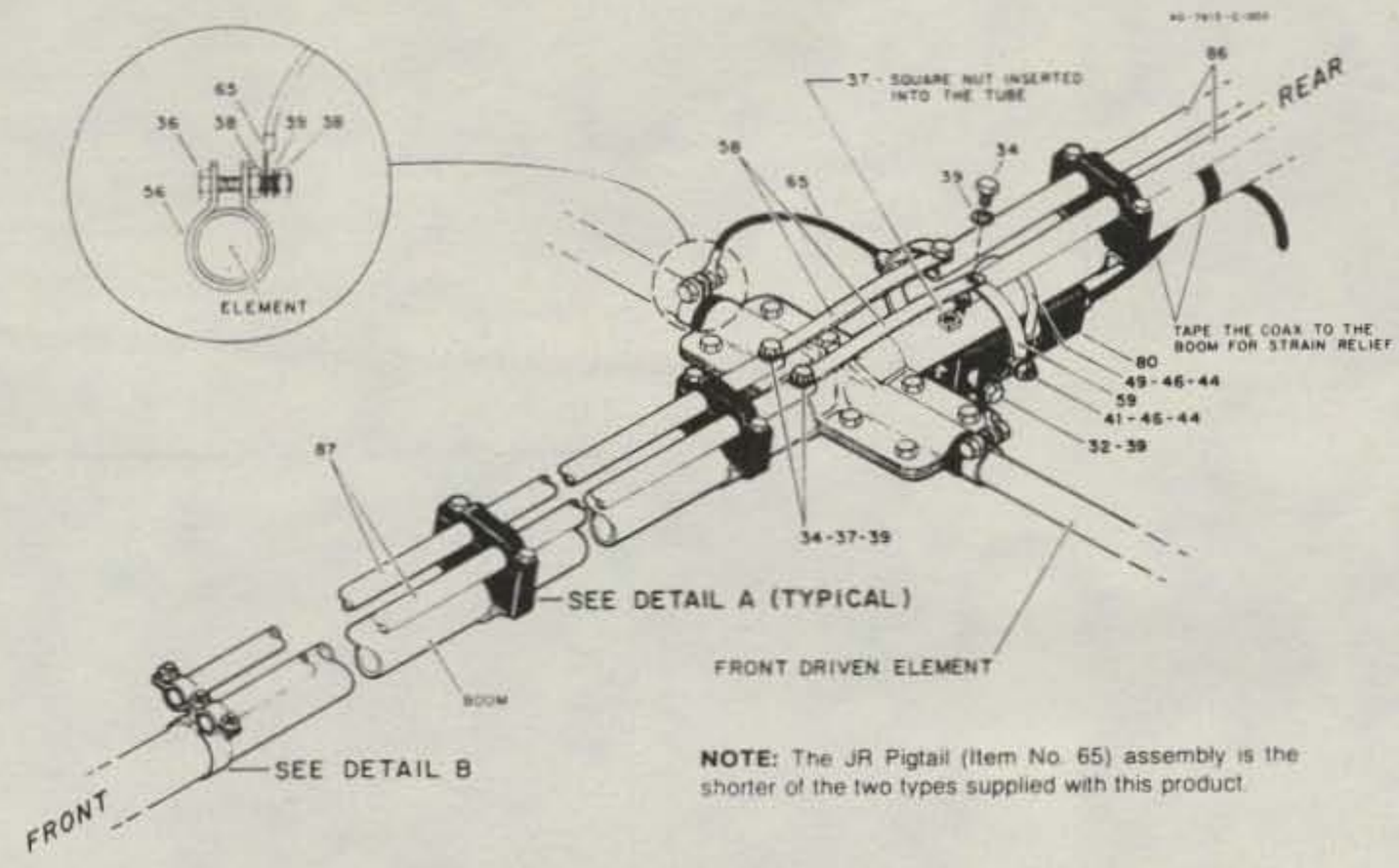
totally agree. There is simply no sense in rushing to assemble a highly sophisticated antenna such as the TH7, elevating it to 30 to 100 feet above ground, and then finding that a simple assembly mistake has taken place such that its performance is compromised.

Besides the diagrams in the assembly manual, a separate large-size diagram (similar to fig. 1) is supplied which one can use as a carry-around diagram or possibly mark up as a checklist as various assembly steps are completed and as dimensions are double-checked.

All in all, assembly of the TH7 is not at all difficult. It just takes a bit of time because of all the hardware pieces involved and because all the telescoping tubing dimensions must be held to an assembly tolerance of no more than ⅛ inch, plus or minus, from those shown on the assembly diagrams. There is no reason why the assembly of the TH7 cannot be as interesting a project as assembling an electronic kit when one takes pride in getting the components lined up in a neat manner and having good, clean connections. Patience and taking pride in getting the job done right are the keys!

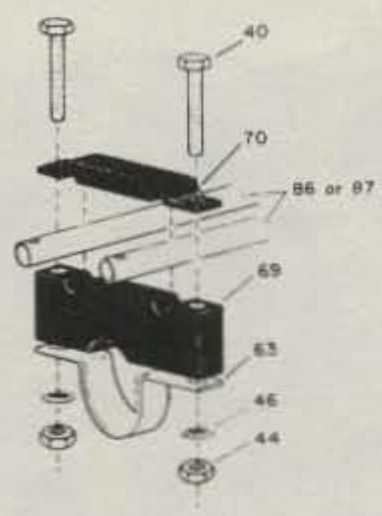
Hardware

The materials used for the construction of the TH7 have to be rated as first class. All of the compression clamps and other hardware having to do with electrical connection points are made of stainless steel. The element-to-boom mounting system (partially shown in fig. 3) is very sturdy in that two clamps fit over each end of a

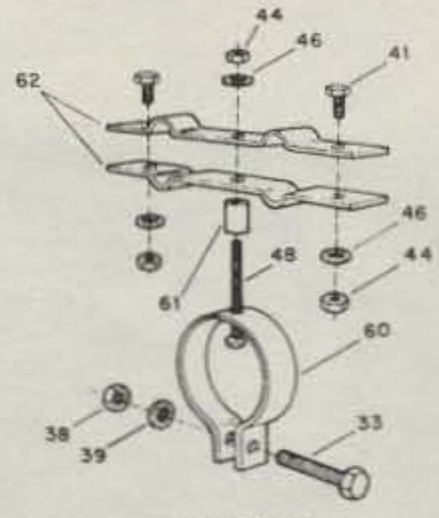


NOTE: The JR Pigtail (Item No. 65) assembly is the shorter of the two types supplied with this product.

Item No.	Description
32	Bolt, hex head, ¼"-20 x ⅜"
33	Bolt, hex head, ¼"-20 x 1½"
34	Bolt, hex head, ¼"-20 x ¾"
36	Bolt, hex head, ¼"-20 x 1¼"
37	Nut, square, ¼"-20
38	Nut, hex, ¼"-20
39	Lockwasher, internal, ¼"
40	Bolt, hex head, #10-24 x 2"
41	Bolt, hex head, #10-24 x ½"
44	Nut, hex, #10-24
46	Lockwasher, internal, #10
48	Bolt, hex head, #10-24 x 1½"
49	U-Bolt, #10-24 x 2½" x 2¾"
56	Clamp, Tubing, 1¼"
58	Beta Feed Jumper, TH7DX
59	Feed Strap, TH7DX
60	Strap, Boom-to-Beta, 2" I.D.
61	Sleeve, Beta Shorting
62	Strap, Beta Shorting, ⅛" radius
63	Clamp, Beta Support
65	Pigtail Wire, Jr., 6½"
69	Insulator, Beta Support (Bottom)
70	Insulator, Beta Support (Top)
80	Balun, BN-86, 50 ohm
86	Phasing Tubes, ¾" x 23"
87	Beta Tubes, ¾" x 70"



DETAIL A
BETA SUPPORT CLAMPS
AND INSULATOR ASSEMBLY



DETAIL B
BETA SHORTING CLAMP ASSEMBLY

Figure 11
Pigtail to Balun Connection and Front Driven Element

-16-

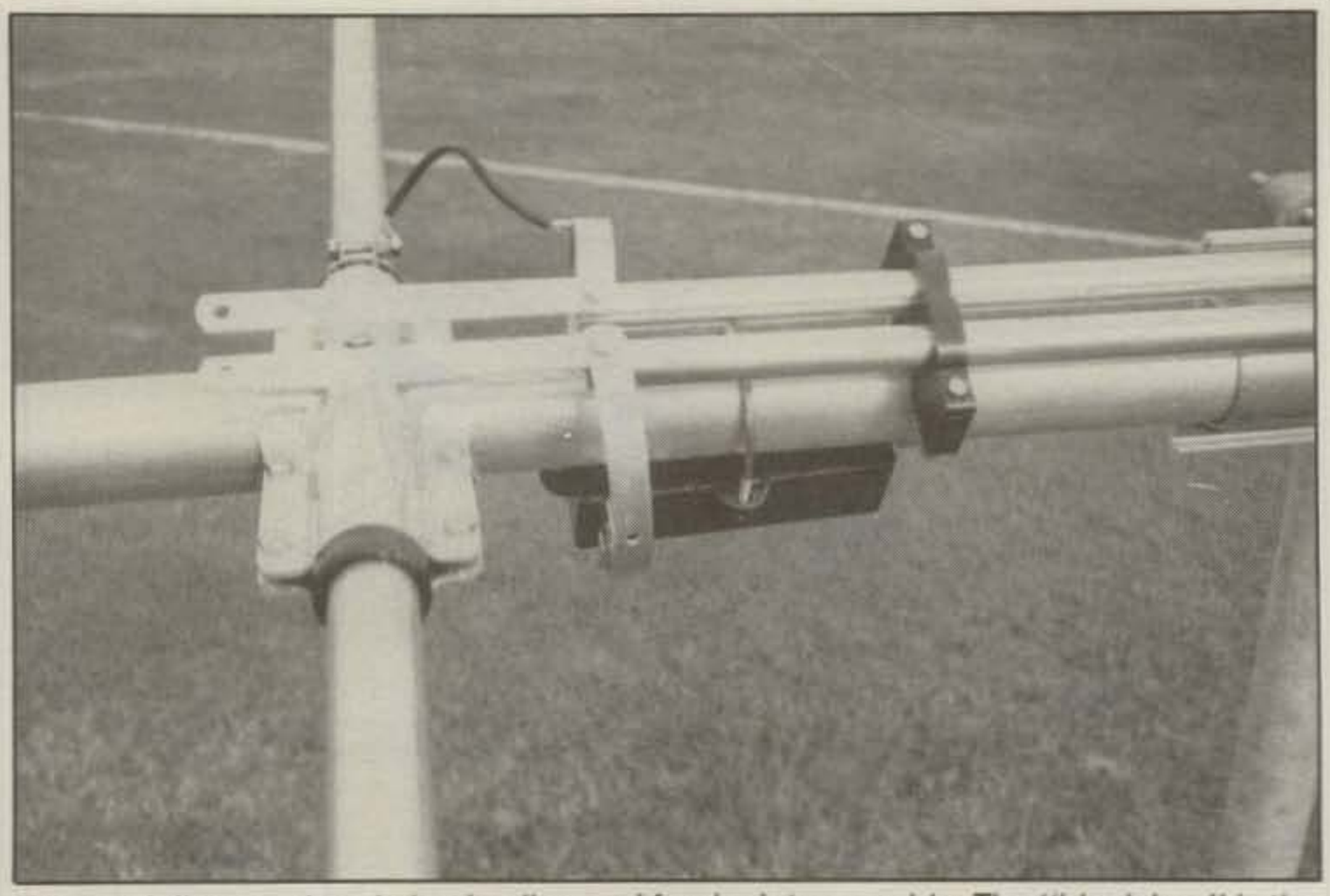
Fig. 3– An example of the very well illustrated assembly instructions contained in the TH7 manual.

given element, and the clamp assembly itself has a center bolt going into the boom so the clamp assembly cannot move on the boom. Of course, even this type of construction cannot prevent a beam element from breaking off under extreme wind conditions. However, if such an instance should take place, replacement of the beam element is greatly simplified by the type of clamp assembly used in the TH7, since one only has to loosen the bolts on the clamp assembly and insert a new beam element.

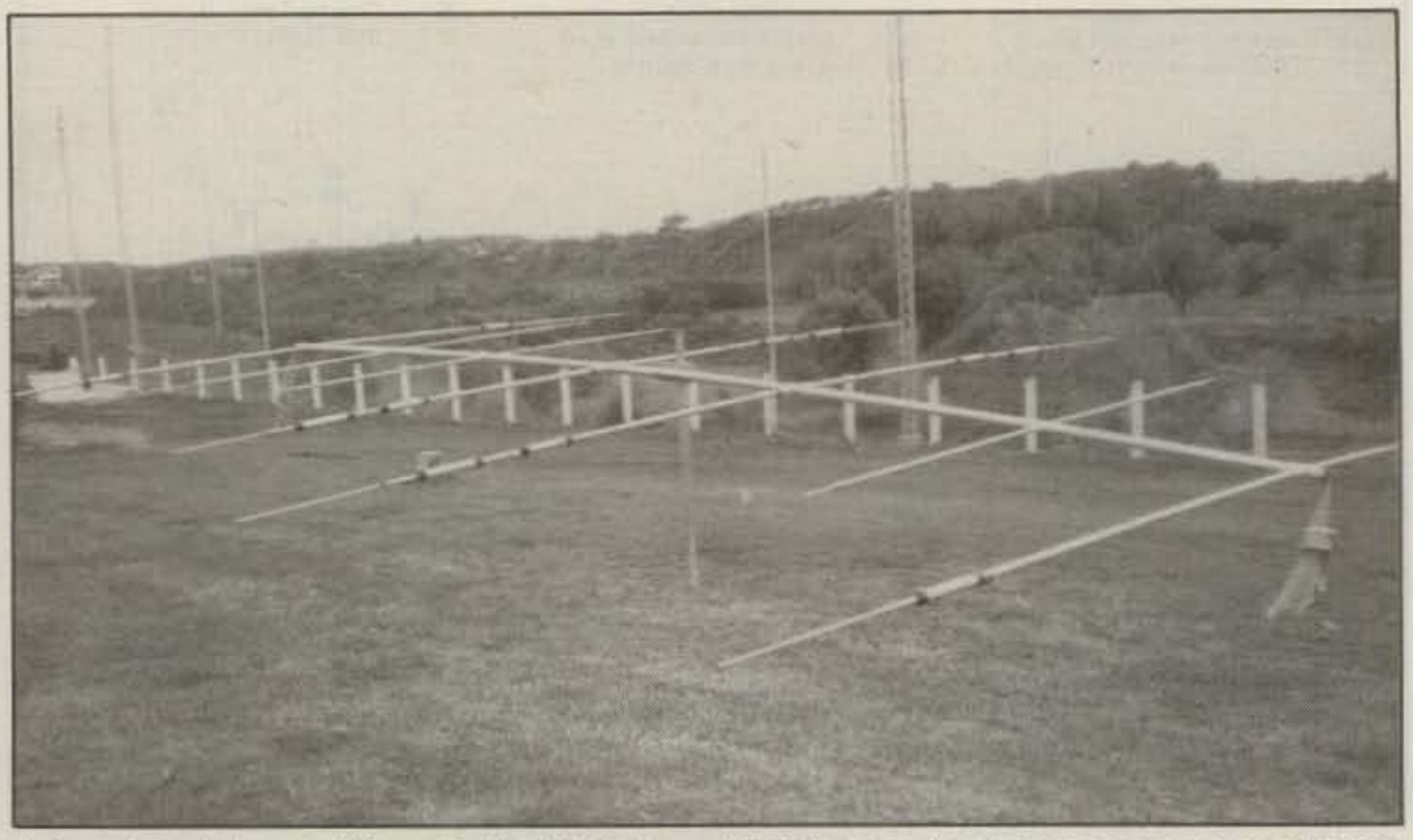
The boom-to-mast assembly consists of two very heavy-duty cast-aluminum brackets with some seven bolts, lockwashers, and nuts. One can be fairly well certain that the TH7 will never come loose from its mast! Overall, the quality of the materials used for the construction of the TH7 augurs for trouble-free operation for an extended number of years. However, one should take a note from the professionals and have an antenna maintenance schedule, particularly if one is going to have a big antenna elevated high in the sky. Depending upon whether your QTH is high in the mountains surrounded by non-polluted air or next to an ocean, salt-spray environment, that schedule should have the antenna coming down for cleaning and visual inspection every six months to one year.

Initial Tests

Mounted on top of a 60 foot tower and in relatively clear terrain similar to that found in a suburban area without any significantly high trees, the TH7 presented an



The partially completed phasing line and feedpoint assembly. The "block box" is the balun. Very rugged hardware is used.



A few days later and there is the TH7 almost finished on its temporary mast and ready to be elevated.

SWR bandwidth (SWR not to exceed 2.0 at either the low- or high-frequency point on each band) as follows:

10 meters: 28.0 MHz to 29.9 MHz (1900 kHz)
15 meters: 21.0 MHz to 21.55 MHz (550 kHz)
20 meters: 13.95 MHz to 14.4 MHz (405 kHz)

These results closely follow those suggested by Hy-Gain for mounting heights between 30 and 100 feet (fig. 4). But to say the least, the SWR bandwidth can be considered very good, if not outstanding. An average 3-element triband beam, for instance, might exhibit only 200–300 kHz bandwidth on 20 meters, 300 kHz on 15 meters, and 700–900 kHz on 10 meters. Quite obviously, the dual driven element design and wide-element spacing of the TH7 really mean something.

The TH7 was actually mounted at the side of an antenna range consisting of mostly HF rhombic antennas, and the opportunity did present itself to make many comparison tests between the TH7 and various rhombic antennas which had documented gain figures. Although this type of comparison testing cannot be regarded as controlled as those obtained on a true antenna test range, they did indicate that the forward gain of the TH7 ranged from about 10.5 dBi on 10 meters to 9.5 dBi on 20 meters. These figures are a bit higher than Hy-Gain claims in their specifications for the TH-7 (Table I), but I am convinced that if anything they lean toward the conservative side. The same holds true with

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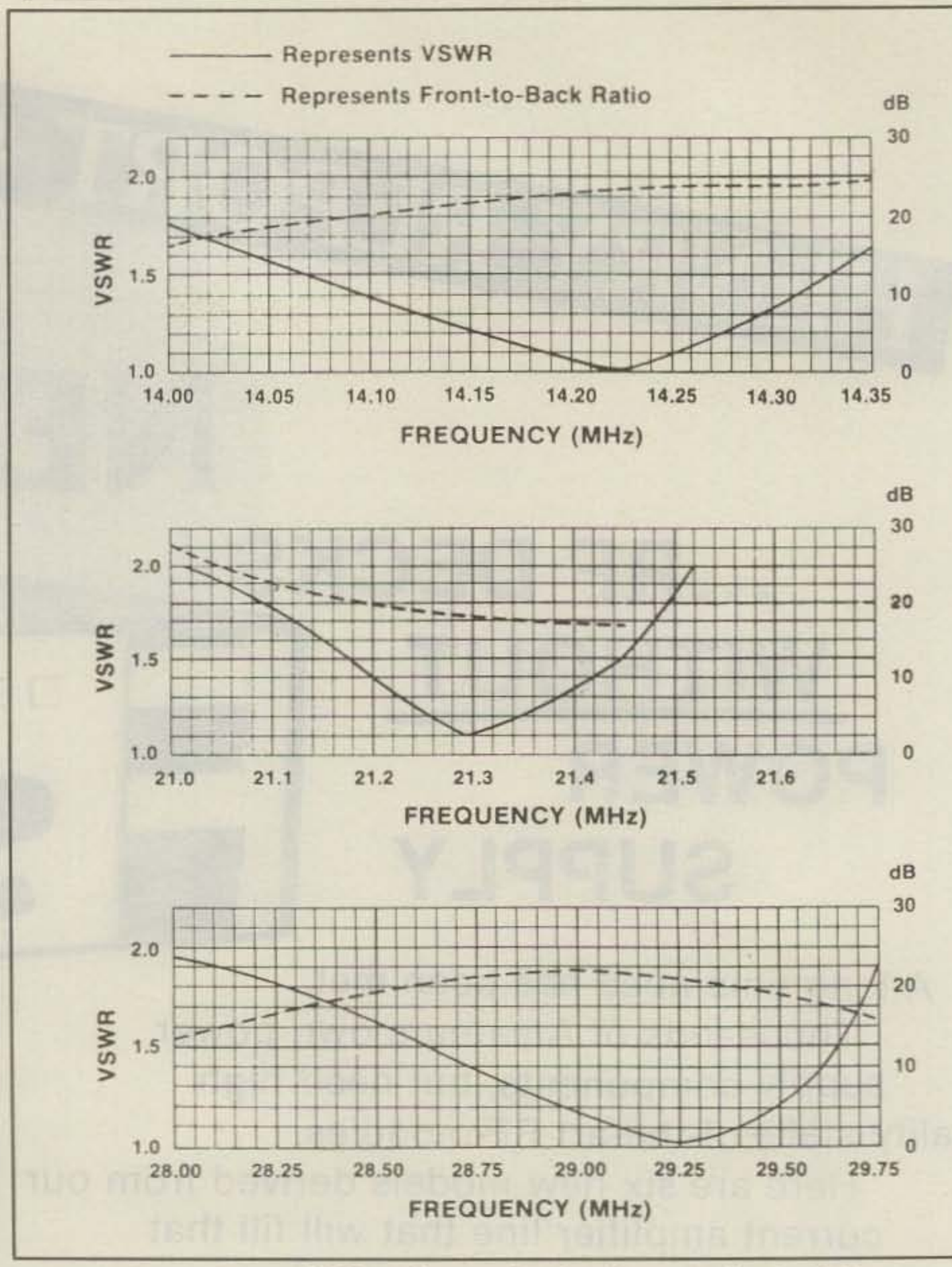

Fig. 4– Typical SWR and front-to-back ratio curves for the TH7.

regard to front-to-back ratio. The TH7 appeared to have a front-to-back ratio on all bands of about 23–25 dB, which again only means something if one compares those figures to those of average 3-element triband beams which might present a 15–18 dB front-to-back ratio (please note that this refers only to full-size triband beams, not to mini-beams).

Operating Results

Excellent, especially when one considers the combination of parameters involved. The TH7 is a fairly large antenna with its 24 foot boom, but it is hardly a "super giant" antenna, and yet it has excellent bandwidth, forward gain, and front-to-back ratio. I wish I could have tested it against the 90 foot boom, 12-element 20 meter beam a W0 friend of mine demonstrated to me years ago. I suspect he would easily have been an "S" unit or so up on me, but I think I could have easily worked three new countries with the TH7 by the time he worked the first one with his giant signal because of the extremely sharp beamwidth of his antenna and the time it took to rotate it around.

DXCC in one week? Well, I don't think it would have been any problem with the TH7 from my SV QTH in spite of fierce European QRM. Using the TH7 with a barefoot TS-940S, DX such as ZD9, D68, J28, P29, 3D6, 7P8, 9Y4, S78, etc., was easily worked over the European QRM and, of course, working Stateside was an easy pleasure.

The Manual

As was mentioned before, only about half of the pages contained in the TH7 assembly manual are actually concerned with the physical assembly of the antenna. So what subjects are covered in the rest of the manual? Well, I would say it contains a wealth of practical information on the installation of beam antennas and their proper "care and feeding." As with the manual

for the Explorer 14 antenna, one gets the distinct impression that the manufacturer wants to be sure that the user of a TH7 gets the antenna installed properly, enjoys using it, and properly maintains it for years of operation. The parts list is absolutely complete, and detailed addresses and telephone numbers are given for Telex/Hy-Gain offices in both Lincoln, Nebraska and Minneapolis, Minnesota which will handle customer inquiries or requests. Interestingly enough, the manual even mentions that an engineering report (Form No. 5314) detailing the design and specifications of the TH7 is available free of charge from Telex/Hy - gain (P.O. Box 5579, Lincoln, Nebraska 68505). I'm not quite sure why the manufacturer offers the report to those who have already purchased the antenna rather than to those who might be interested in the antenna. Anyway, if you fall into the latter category, I would strongly suggest sending for the report.

Since I especially enjoy reading a well-written manual, I could mention many more details about the TH7 manual, but I'll settle on two last points: the trouble-shooting chart and VSWR Record chart contained in the manual. The troubleshooting chart contains a lot of practical hints, most of which are common-sense items, but it highlights things that one might forget when one encounters a problem. For instance, if the antenna exhibits high SWR *only* in rainy or very humid weather, what might be the problem? Most of us would probably guess at water getting in the coaxial feedline someplace, but I don't think too many of us would think, as the chart suggests, of looking at how the traps on the antenna were installed. If one or more of them were installed with their water drain holes up instead of down, that could well be the cause of the problem!

The VSWR Record chart from the TH7 manual is shown in fig. 5. It's a simple SWR recording chart and represents a good maintenance idea for almost any antenna system. Readings can be taken and recorded every few months or so, and although the readings might vary very slightly from time to time, any significant change or developing trend to higher and higher SWR's should surely be an alert signal that something is wrong. Hy-Gain suggests taking the SWR readings using low power (less than 200 watts output). I would suggest taking the readings using both low power and the highest power output available. Some developing faults in an antenna system only first manifest themselves at high power levels.

Summary

An antenna such as the TH7DX is likely to be a major punch for many amateurs, and although it costs far less per dB of gain than any linear amplifier, it is not an inexpensive investment when one considers the cost of a rotator, tower, and the plain hard work involved in getting the whole system working. It is worth the effort? Well, as I mentioned at the start of this article, I have never spoken to any amateur who would willingly go back to a small beam after having experienced an "ultimate" beam such as the TH7.

I would rate the TH7 as an outstanding buy in all respects. Its electrical characteristics (bandwidth, gain, and front-to-back ratio) are superior for a tribander having a 24 foot boom. The materials used for its construction are first class, and the beam should easily endure for years of dependable service as long as one takes the simplest, most elemental steps to periodically check and clean the antenna. CQ

VSWR RECORD

Type of VSWR Meter _____

Frequency	Date _____ VSWR	Date _____ VSWR	Date _____ VSWR	Date _____ VSWR
14.00				
14.10				
14.20				
14.30				
14.35				
21.00				
21.10				
21.20				
21.30				
21.40				
21.45				
28.00				
28.25				
28.50				
28.75				
29.00				
29.25				
29.50				
29.70				

Fig. 5– The SWR Record sheet from the TH7 manual. It represents a simple, efficient way to keep a record sheet for almost any antenna system.

How high is high? How high to place an antenna also depends on what you want to do with it.

Modeling Radiation Patterns From Vertical Dipoles Using The Cushcraft R3 Antenna

BY JAMES J. COLEMAN*, KA6A/9

The Cushcraft R3 vertical antenna is an attractive compromise multiband antenna (10, 15, and 20 meters) for amateurs without the financial resources or real estate for more elaborate antenna systems. The manufacturer promises 3 dB gain, with reference to a ¼-wavelength vertical, and no radials are required for ground or roof mounting. The antenna is clearly a low-band equivalent to the well-known Ringo series of UHF ½-wavelength verticals also made by Cushcraft. The R3 has been in use at the QTH of KA6A/9 (and XYL, Teri, N9ESA) for about a year and a half with generally good results. While the antenna cannot compare with a seven-element monobander, it is definitely much better than ground- or roof-mounted ¼ λ verticals and dipoles. No amateur radio operator is ever happy with his antenna system, however, especially when the sunspot cycle is approaching a minimum, so recently I have been considering how best to optimize the R3's performance.

The assembly and installation instructions included with the antenna say nothing about the theory of operation of the R3 and recommend only that it be mounted "high and in the clear." An excellent description of end-fed ½ λ vertical antennas is given in a *CQ* Review of the R3 by W4FA.[1] An electrical equivalent circuit for the antenna and comparisons to other vertical antenna systems are given in this review. Basically, the antenna is made to be electrically ½ λ long, and a suitable, low-impedance feedpoint is obtained for all three bands by utilizing a motor-driven capacitance in an L-C tuning network at the base of the antenna. W4FA recommends mounting the R3 high and in the clear also.

In order to study the nature of radiation from vertical dipoles, as opposed to vertical ¼ λ antennas, one must consider first the radiation of vertical dipoles alone, and then include the effects of reflection from the earth. *The ARRL Antenna Book*[2] mentions briefly, in the section on the effect of antenna height on horizontal dipoles, that vertical dipoles do not behave in the same way as horizontal dipoles. The current flow in the image of a vertical dipole over perfectly conducting earth is in phase with the antenna[3] as shown in fig. 1. This is in contrast to the case for the horizontal dipole in which the current in the antenna and its image are 180 degrees out of phase. Thus, a vertical dipole and its image can be modeled as a two-element colinear array.

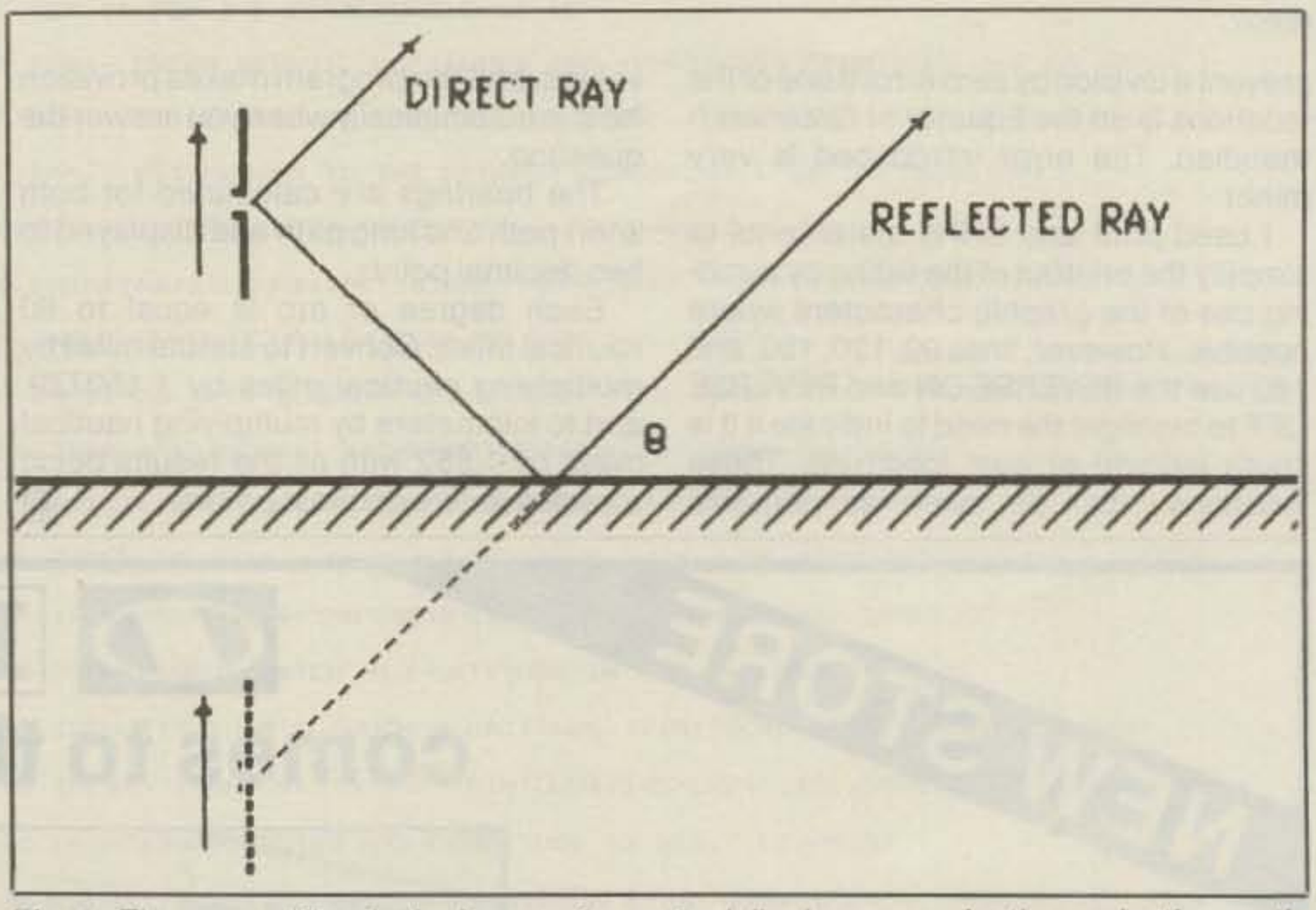

Fig. 1– The current flow in the image of a vertical dipole over perfectly conducting earth is in phase with the antenna.

The field pattern for each ½ λ dipole in the colinear array is given by [3]

$$E_0 = \cos(0.5\pi\cos\theta)/\sin\theta \qquad (1)$$

where θ is the angle between a line drawn from an observer to the center of the antenna and the long direction of the antenna. The phase difference between the two radiators in a colinear array is given by

$$\xi = (2\pi/\lambda)d\cos\theta + \alpha \qquad (2)$$

where α is the phase difference between the driving currents of the two elements and **d** is the distance between the elements. The term α is zero since the second antenna is an image and not actually driven. The phasor sum of the fields will be[3]

$$E = E_0(1 + e^{j\xi}) \qquad (3)$$

Thus, the magnitude of the total field strength of the colinear array is given by

$$E_T = E_0[(1 + \cos\xi)^2 + \sin^2\xi]^{1/2} \qquad (4)$$

This equation is easily solved manually, point-for-point, or by using a fairly simple BASIC program to solve for any increment of angle.

Using equation **(4)** above, one can obtain the field pattern for the three bands of the R3, if the physical height of the antenna is known. The spacing term **d**, is simply double the height of the antenna. At

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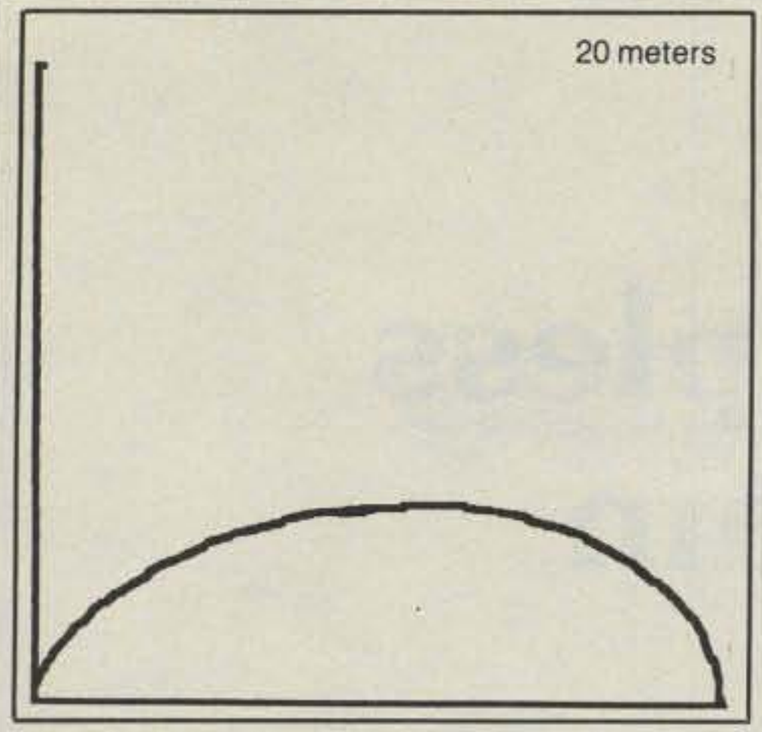


Fig. 2– The ideal field pattern for a 20 meter vertical.

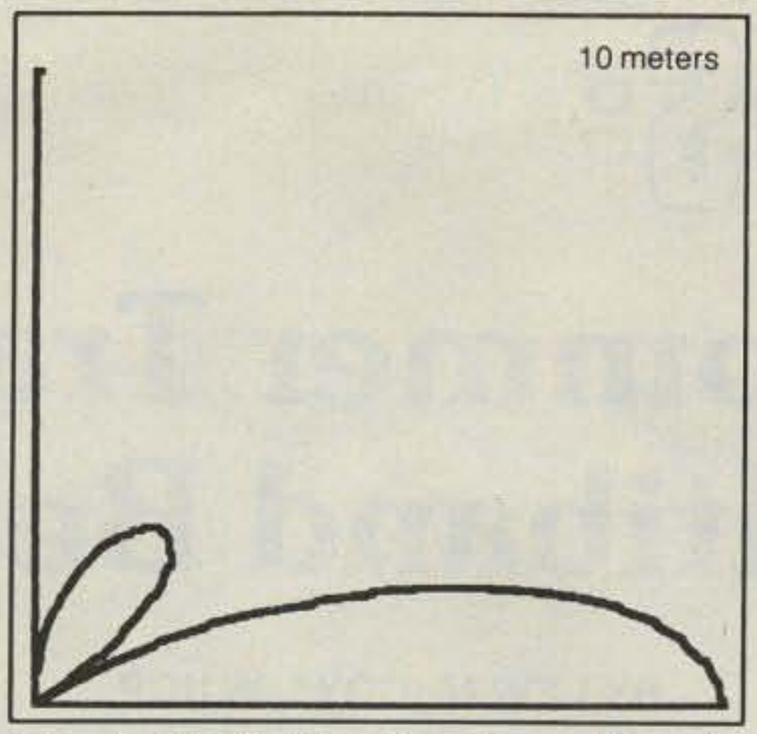


Fig. 4– The field pattern for a 10 meter vertical.

KA6A/9 the antenna is about 15 feet off the ground, so the spacing **d** is

10 meters d = 0.897 λ
15 meters d = 0.673 λ
20 meters d = 0.449 λ

The calculated, ideal field pattern for 20 meters is shown in fig. 2. For all practical purposes, 100% of the radiated energy is in a single lobe with an average angle of radiation (obtained from numerical integration assuming no energy is transmitted below the horizon) of about 20° above the horizon. Contrast this with a single dipole element which has half the field strength (the 3 dB gain) at an average angle of 28°. The difference in launch angle can result in single-skip distances that are more than 47% greater than for a dipole (if the *F*-layer height is 131 miles[2]).

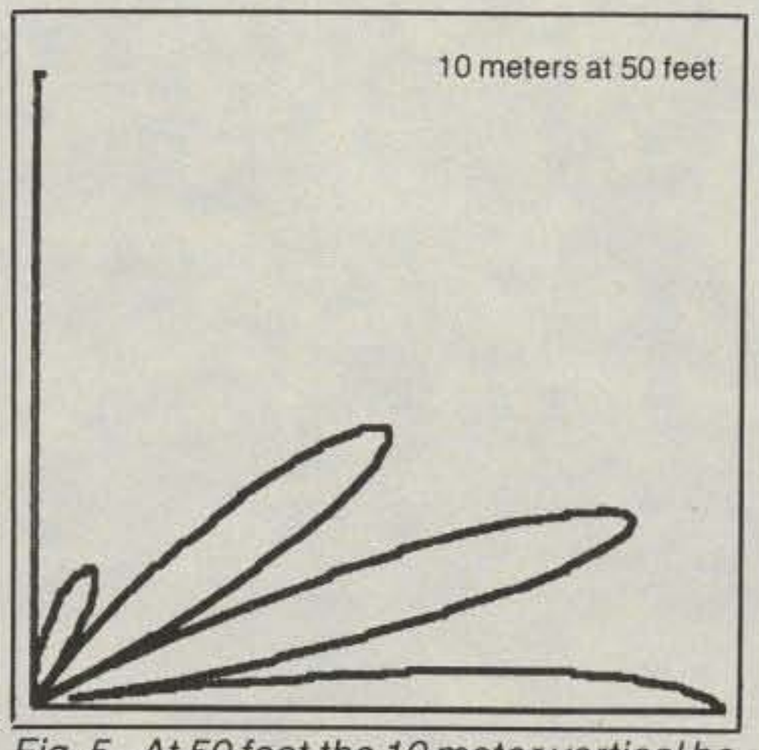


Fig. 5– At 50 feet the 10 meter vertical becomes a local antenna rather than one for working DX.

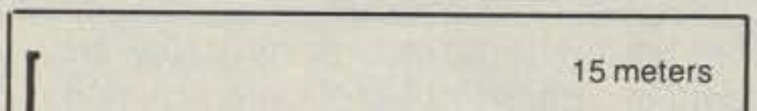


Fig. 3– The field pattern for a 15 meter vertical.

The field patterns for 15 and 10 meters are shown in figs. 3 and 4. At 15 meters radiation lobes at higher angles become evident (67°), although almost 90% of the energy is found in the main lobe, which has a launch angle of 14°. This lower angle of radiation results in an 83% increase in the single-skip distance relative to a single, vertical, ground-mounted dipole. At 10 meters the radiation lobe at 59° contains more than 36% of the radiated energy. While the main lobe has a launch angle of only 10°, which results in single-skip distances 2.2 times longer than for a dipole, a significant fraction of the energy is lost to distances of less than half that expected for a dipole.

All of this analysis is based on ideal, perfectly conducting ground. The soil conductivity in east-central Illinois is nearly as high as any in the US.[3] Unfortunately, even the highest soil conductivity in the US does not present a perfectly conducting ground plane.

The point of this discussion is that, for vertical dipoles above moderately conductive soil at least, perhaps higher is not better. As an illustration, the field pattern for the R3 operating at 10 meters from a 50 foot tower is shown in fig. 5. The four lobes in the pattern indicate that while this may be a better antenna for general operating (rag chewing or WAS) much more energy is radiated at angles other than the desirable low angle for DX.[4]

Footnotes

1. "The Cushcraft R3 Vertical Multiband Antenna," John J. Schultz, W4FA, *CQ* magazine, p. 40, April 1983.

2. *The ARRL Antenna Book,* American Radio Relay League (Newington, CT, 1982).

3. *Electromagnetic Waves and Radiating Systems, 2nd Edition,* E.C. Jordan and K.G. Balmain, Prentice-Hall (Englewood Cliffs, NJ, 1968).

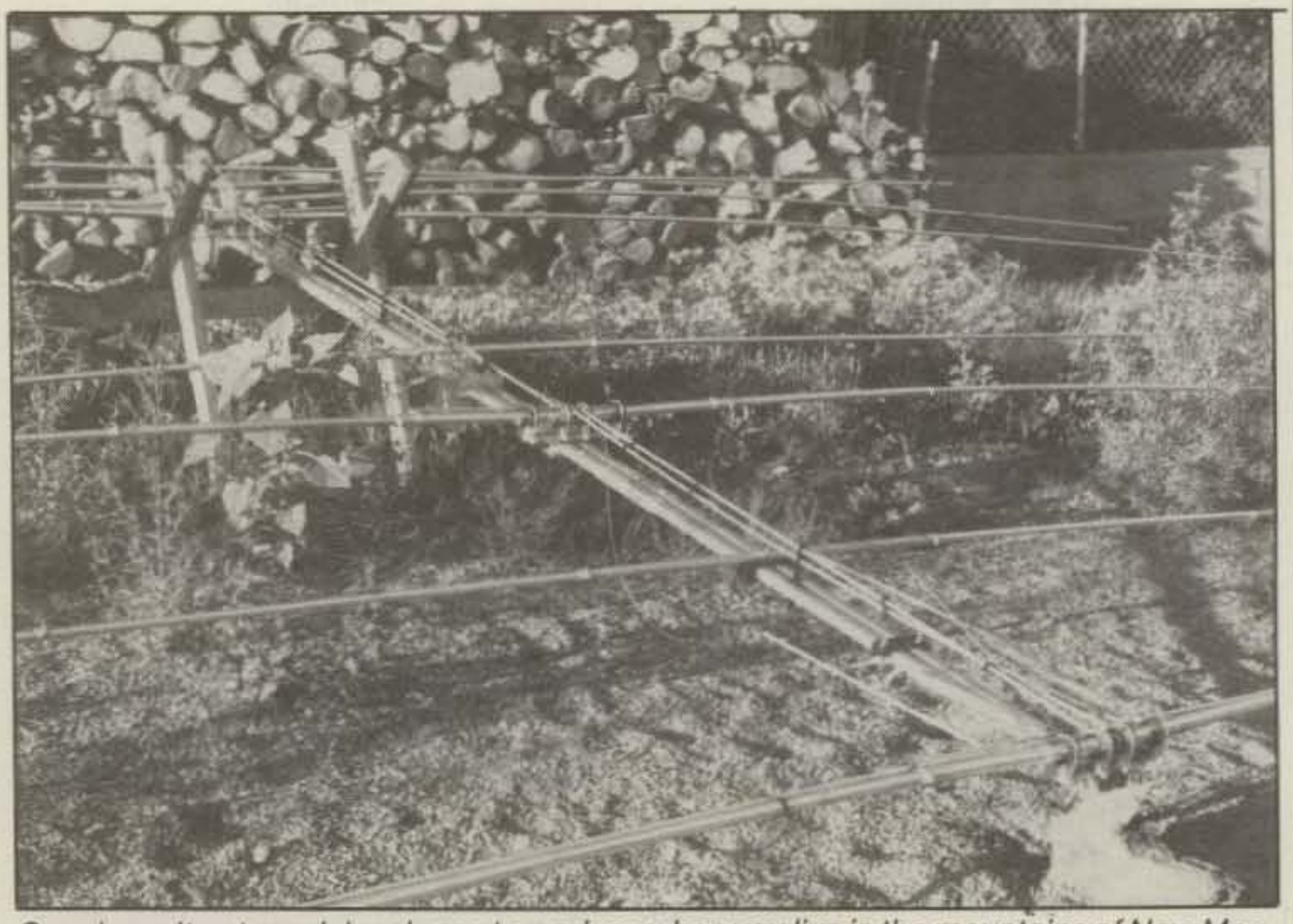
4. The author gratefully acknowledges many helpful discussions with Yuri Moroz, Brian Moroz, and Fred Ore, W9TBB.

CQ REVIEWS:

The Sommer Trapless Multiband Beam

BY LEW McCOY*, W1ICP

As many readers know, I have spent the majority of my amateur career writing about antennas, making antennas, building Transmatches and Monimatches, and lecturing in this field. In fact, I am coming up on 40 years on the subject. I have to add that my interest in the subject of antennas has never lessened. During my career I have built Rhombics, Sterbas curtains, countless beams, and devised new antenna systems. More important, I have worked with some famous people and studied the works of others, including people like George Grammar, By Goodman, Tilton, Jascyk, and certainly not least, Dr. Yagi. By Goodman once said he was going to claim me as an IRS deduction because he devoted so much time and money to my training! For those readers who don't associate the name By Goodman, W1DX, with antennas, let me say that he organized and edited the first ARRL *Antenna Manual*. Enough said?



One doesn't get much level area to work on when you live in the mountains of New Mexico. In any case, here is the DJ2UT beam completely assembled prior to erection.

Some Multiband Antenna Background

So what has all this to do with a product review in *CQ*? Very simple! This review has to take us all a long way back in antenna design to what works and what doesn't. Anyone who has studied the literature on beams knows that Yagi and Uda wrote some very basic information about parasitically excited elements in antenna configurations. Prior to this time, completely driven arrays were in vogue. (Remember the 8JK?) The parasitic array consists of the feedline going to one element of the array (driven element) and then parasitically exciting other elements—usually directors and a reflector. The 8JK, on the other hand, consisted of two elements, both driven, and it could be used on more than one band, while the Yagi was designed for single-band operation.

The logical extension of the Yagi beam was an idea that was put forth by Ed Buchanan, W3DZZ, back in 1953 in *QST*, when he came up with the idea of tribanding a Yagi to cover 20, 15, and 10 meters. Let's be very honest. It is well nigh impossible to build a trap antenna (Buchanan's concept) without introducing appreciable losses because of traps. Additional losses take place because of compromises in element lengths and spacing to achieve a match for 50 ohm feed and broadbanding.

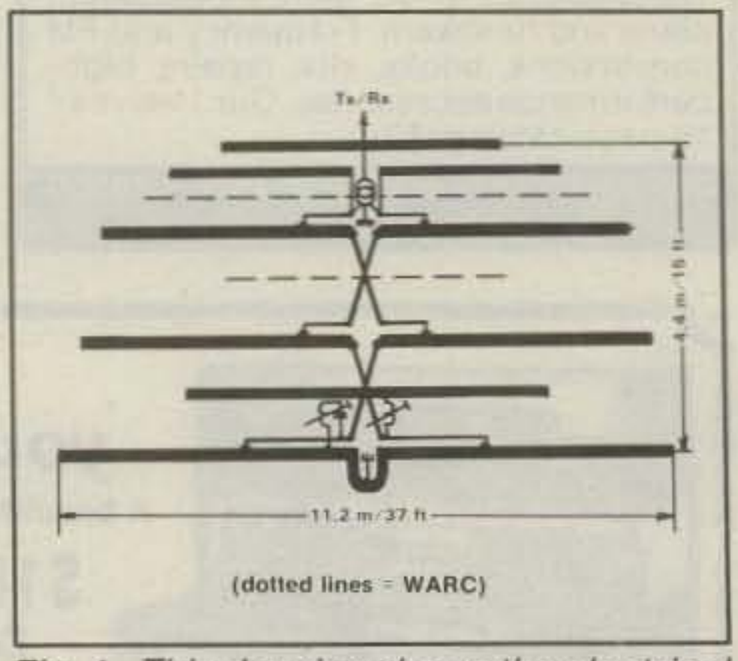


Fig. 1–This drawing shows the electrical layout of the XP507.

Also many years ago, it was established that excellent gain could be obtained with very short spacing of elements on a three-element, monoband beam. With spacings on the order of 0.1 wavelength, the theoretical gain of 7 dB plus could easily be obtained with an outstanding front-to-back ratio. However, and this was disastrous, the radiation resistance (useful power factor of the antenna) dropped to a very low value—10 ohms or less. The bandwidth of such an antenna was very narrow. In fact, such systems wouldn't work with modern transmitter design unless a Transmatch were used. Sure, one could use matching devices to get the impedance up higher, but when you started to think in terms of tribanding—or more—it was very discouraging.

About ten years ago a German amateur named Sommer, DJ2UT, concluded that there had to be a better method of building

*Technical Consultant, CQ, 200 Idaho St., Silver City, NM 88061

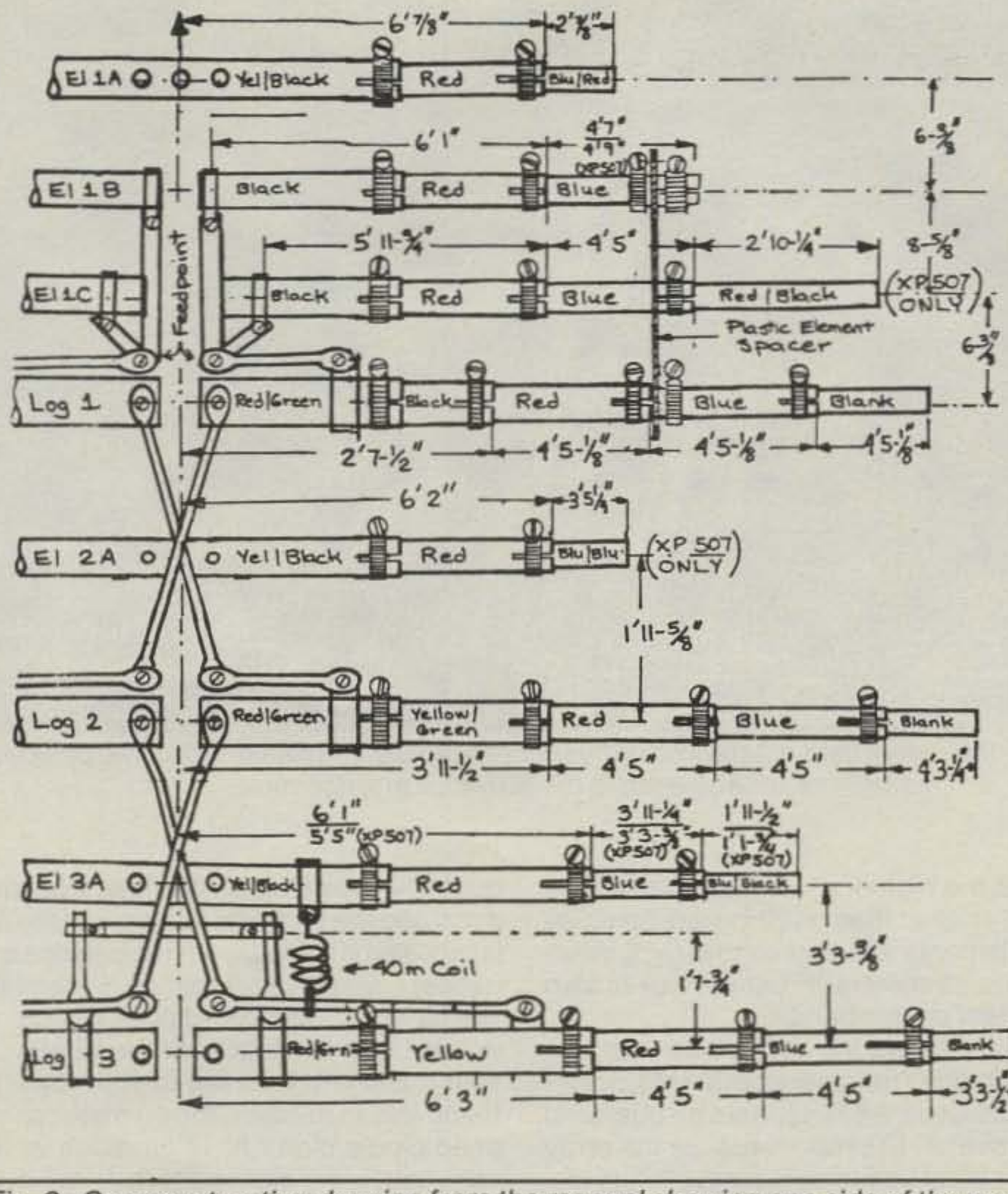


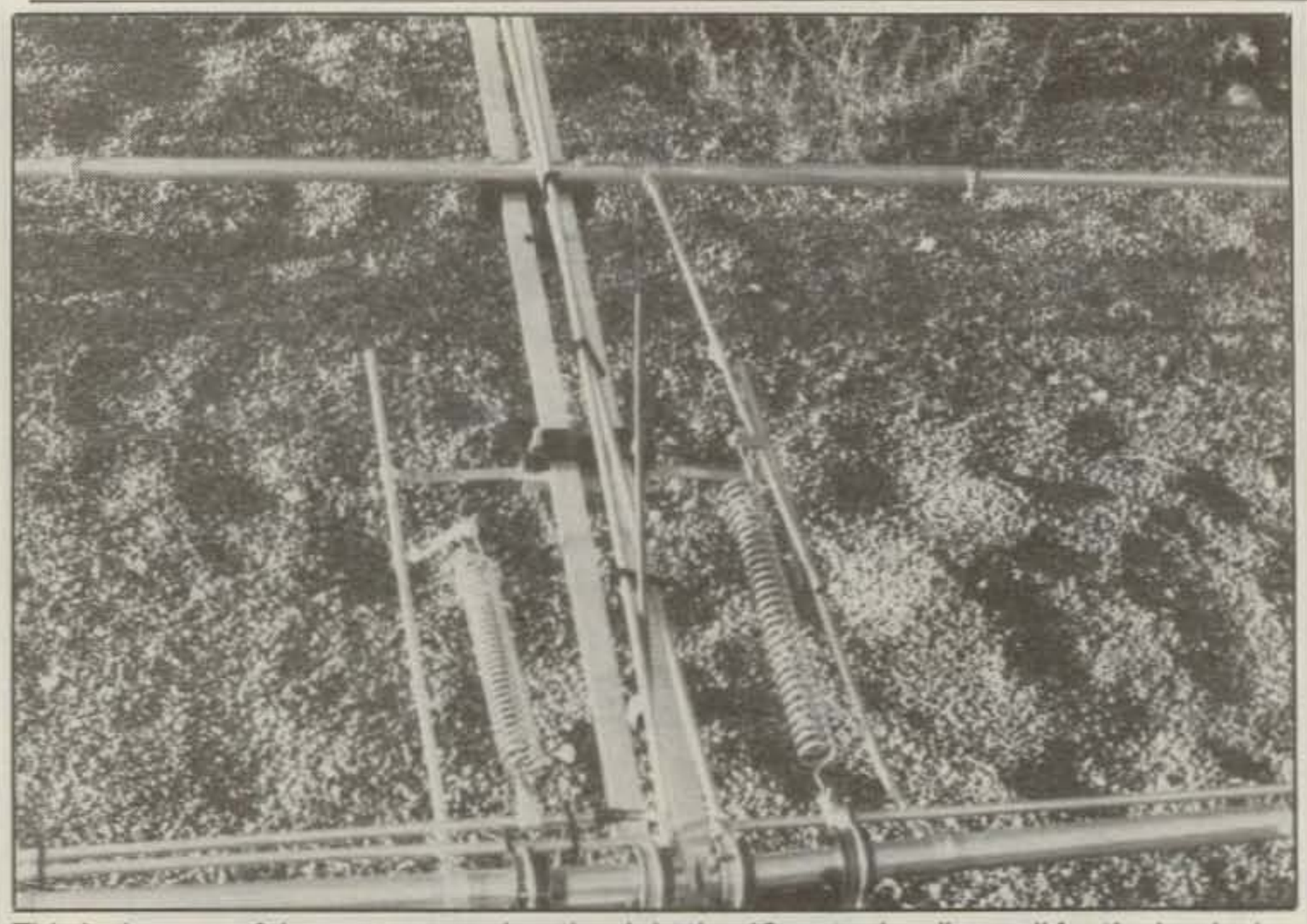
Fig. 2– One construction drawing from the manual showing one side of the array.

multiband beams. He realized that the gain and excellent front-to-back was possible with close spacings, and he was determined to overcome the feed problem (which was really the only tough one). After much experimentation, he achieved the multiband antenna we are discussing in this review. He incorporated some of the ideas from the Hans Rucker, VK2AOU, article (*Ham Radio* magazine, May 1979 issue) plus many of his own innovations. At the Dayton Hamvention in 1984 Sommer displayed his antenna, and there is no doubt that his beam was one of the main points of interest at the show. I told Sommer that *CQ* was very interested in doing a product review, and he was more than receptive to the idea. I was shipped the antenna that was designated the XP506, which is a beam that has 7 bands (10, 12, 15, 17, 20, 30, and 40 meters). And this is all done on a 15 foot boom! To say I was skeptical about such an antenna was putting it very mildly.

A Better Mouse Trap

We all know the cliche "Build a better mouse trap, etc.," but how about catching the mice without any traps, if you'll forgive the pun? First we must consider the bandwidth of the antenna on the various bands. When I did SWR curves for each of the bands, I found that mine, in most instances, were better than those shown in the manufacturer's advertising literature. My XP506 was installed at 55 feet above an almost perfect ground. (I might add that my location is 6300 feet above sea level, almost smack on the continental divide. More important, my earth conductivity is excellent, being an old gold, silver, copper, and manganese mining claim.)

The SWR curve for 20 is less than 1.3 to 1 across the entire band. The manufacturer rates the gain at slightly over 7 dB for most of the 20 meter band. Theoretically, it should have that gain, so I see no reason to question the figure. Also, all the gain figures are measured over a half-wave dipole, not some mythical, make-it-look-good reference. (Keep in mind—no trap losses!) Front-to-back is rated at over 25 dB. In my on-the-air tests, I actually had signals S9 or more off the front, and I couldn't hear them off the back so I know the antenna is not over-rated on that score. On 15 the SWR curve was slightly over 2 to 1 at the low end, dropping quickly about 50 kHz into the band to 1 to 1, and staying flat out to 21.3 and then slowly going up to 1.4



This is the rear of the antenna and on the right the 40 meter loading coil for the back element. At the left is the 30 meter arrangement.

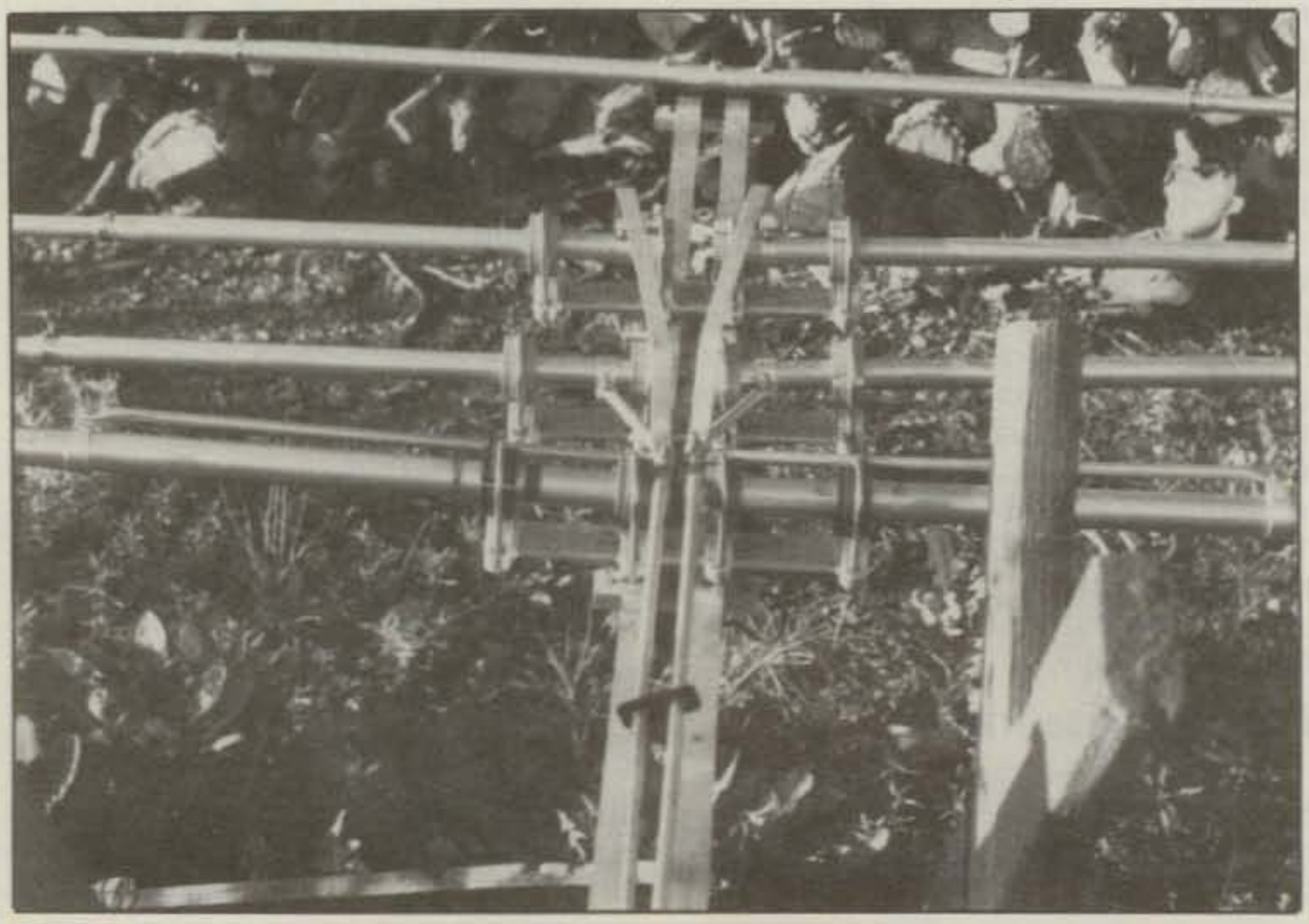
to 1 at the high end. Gain on this band is slightly higher than on 20 meters because the elements are approximately ⅝ wave long on 15 meters. Front-to-back is also excellent on this band.

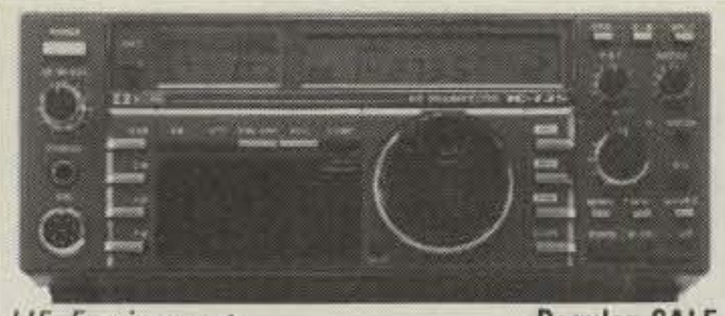
On 10 meters the SWR curve was also outstanding, running less than 1.5 to 1 from 28.2 to 29.6 MHz. Gain on this band goes over 8 dB simply because the array on this band becomes full-wavelength elements—truly a case of bigger is better. Front-to-back is rated at more than 20 dB here.

Of course that is only three bands, and the antenna I tested was actually seven bands. The longest element, at the rear of the beam, 36 feet 8 inches, is used as a quarter-wave dipole on 40 meters, utilizing a coil and the stray capacitance of the adjacent element to achieve reasonance and cancel capacitive reactance. Essentially we have a rotatable dipole (which, of course, is in the best possible location in your station—at the top of your tower). I found that in my case the 40 meter shortened dipole didn't have as much of the common figure-eight pattern as it should. There was directivity of front-to-side, but not as much as I have experienced with previous rotatable dipoles. However, I did get nice reports on 40, so maybe I was being too critical.

As expected, the SWR curve was much sharper on this band, going from 2.5 to 1 at

This is the cluster of elements at the front, which is also the feedpoint of the array.





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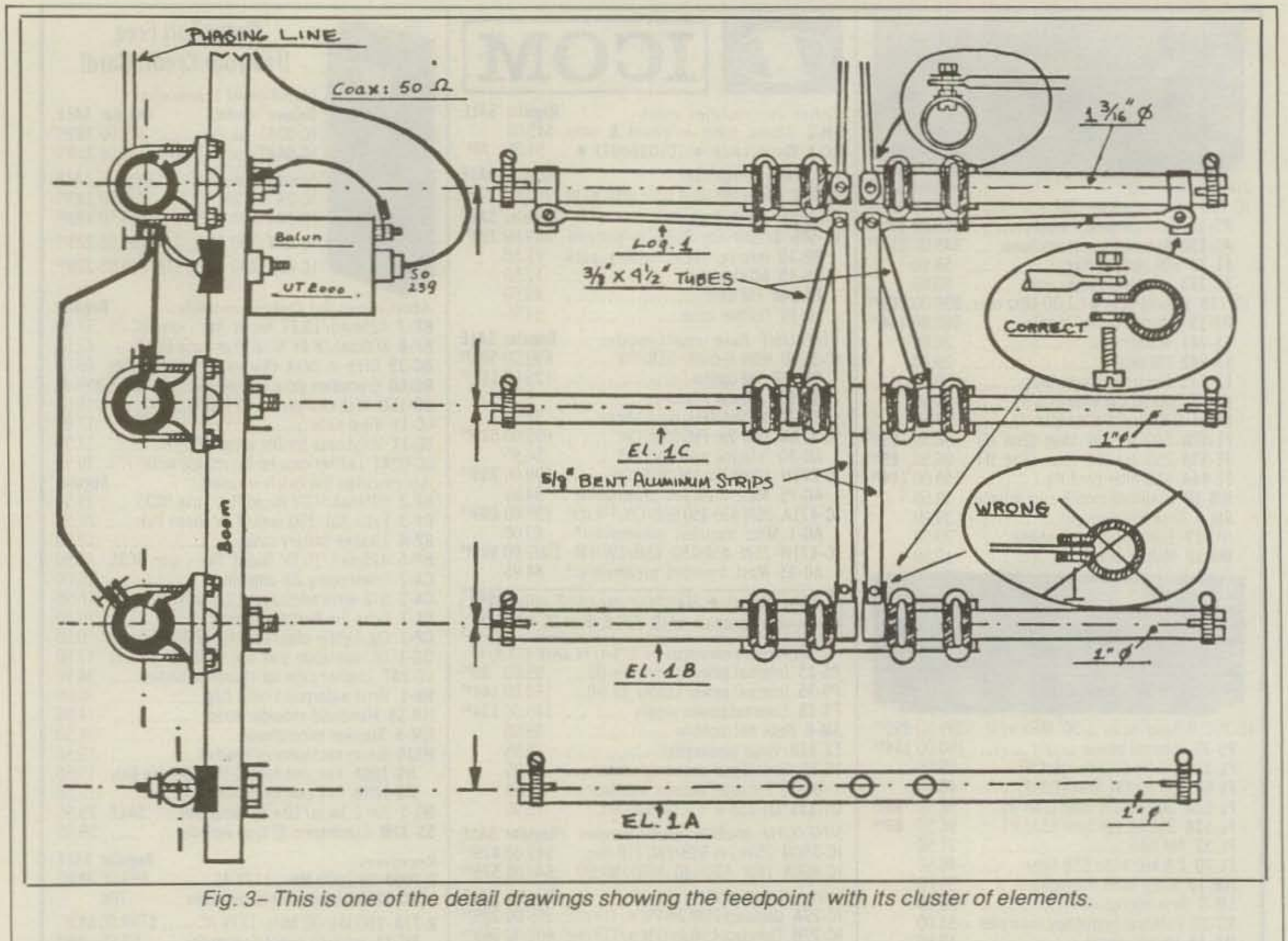


Fig. 3– This is one of the detail drawings showing the feedpoint with its cluster of elements.

the band edges, dropping to a good match at 7.2 MHz. I might add that instructions are given for moving the SWR curve either up or down in the band (CW or phone). However, "tweaking" the 40 meter dipole coil isn't easy unless you have a tilt-over tower such as I have. The SWR for 30 meters is low enough to cover the band adequately.

On 30 meters, 10 MHz, the same element is used as a rotatable dipole with a similar coil/capacitor loading system. However, there is a slight gain over a dipole on this band because the cluster of elements at the front of the array tends to work as a director. As I mentioned above, both 40 and 30 meters can be "tweaked" so that they are right on the nose for the desired operating frequency range. Keep in mind that the SWR is higher off resonance on these bands.

The two newer WARC bands are also in the system, which provides the "seven" bands. I didn't operate there, so I cannot give an evaluation except to say the antenna "listens" extremely well on these frequencies, while checks with a noise bridge also show a very low SWR on these bands.

The antenna is no lightweight, coming in at 66 pounds with a wind-load factor of 10 square feet. I have a Rohn Model 45 crank-over tower with a power-winch, and although I backed it up with another winch, the tower and existing winch handled the beam with ease.

Technical Details

Describing the technical details of an antenna like this is not easy, and some of the information is proprietary for patent reasons. However, let's go through it so you have a better idea of what is happening. (I'll only describe my model because there are others, but more about that in a moment.)

Let's start with 20 meters, because essentially the antenna is based on a 20 meter design. The XP506 has three full-size, 36 foot plus elements, spaced slightly less than 0.1 wavelength, all fed with phasing lines. Through a complex system of T-matches, the resulting feed impedance is 50 ohms. Keep in mind that there are no coils and capacitors in this system—in other words no traps—just a clean completely driven 20-element array (plus the use of full-size elements).

On 15 and 17 meters the 20 meter elements become ⅝-wavelength (approximately) radiators. The matching techniques devised by Sommer with the phasing lines and T-match, etc., plus a cluster of additional elements at the feedpoint, bring the impedance down to 50 ohms.

On 10 and 12 meters the 36 foot long elements become full-wavelength elements, and in this case they are fed via the phasing lines, which in effect make a co-linear array, with the increased gain that results from using such a large colinear system on 10 meters. Using full-wavelength elements would result in a very high impedance, so careful attention is given to matching and bringing the feed impedance down to 50 ohms, which it is.

I have already mentioned the use of the rear element for 40 and 30 meters, so I won't go into additional details on those bands. There are two parasitic elements on the model I had—one at the front of the array for 10 meters (additional gain) and another near the rear for 12 meters.

There are two parasitic elements in the XP506—one at the very front for 10 meters and one near the rear for 12 meters. Just in front of the foremost 20 meter element are two additional driven elements that are part of the feed/broadbanding system. The actual feedpoint is here, through a 1 to 1 balun. The balun is made with a Teflon-insulated coax (which will easily handle 2 kw). The balun is encased in a plastic material enclosure. The SO-239 fitting on the balun is gold-plated!

The boom is made up of two lengths of square aluminum tubing in order to provide additional strength plus added flexibility. Having such a boom is a rather

I have a Rohn Model 45 crank-over, and it proved to be no easy job getting the beam on mast—in the upside-down position. However, with the help of some intrepid local amateurs, we got the job done.

radical departure from the customary aluminum tubing. However, Sommer has excellent basic engineering here in that the boom can flex and stretch, similar to a suspension bridge. The element supports are extremely rugged and really hold the two square sections of the boom together. As you can see from the photos, the element supports are large and are made from cast aluminum. A stay guy is used to give additional support, and it is made from stranded stainless steel.

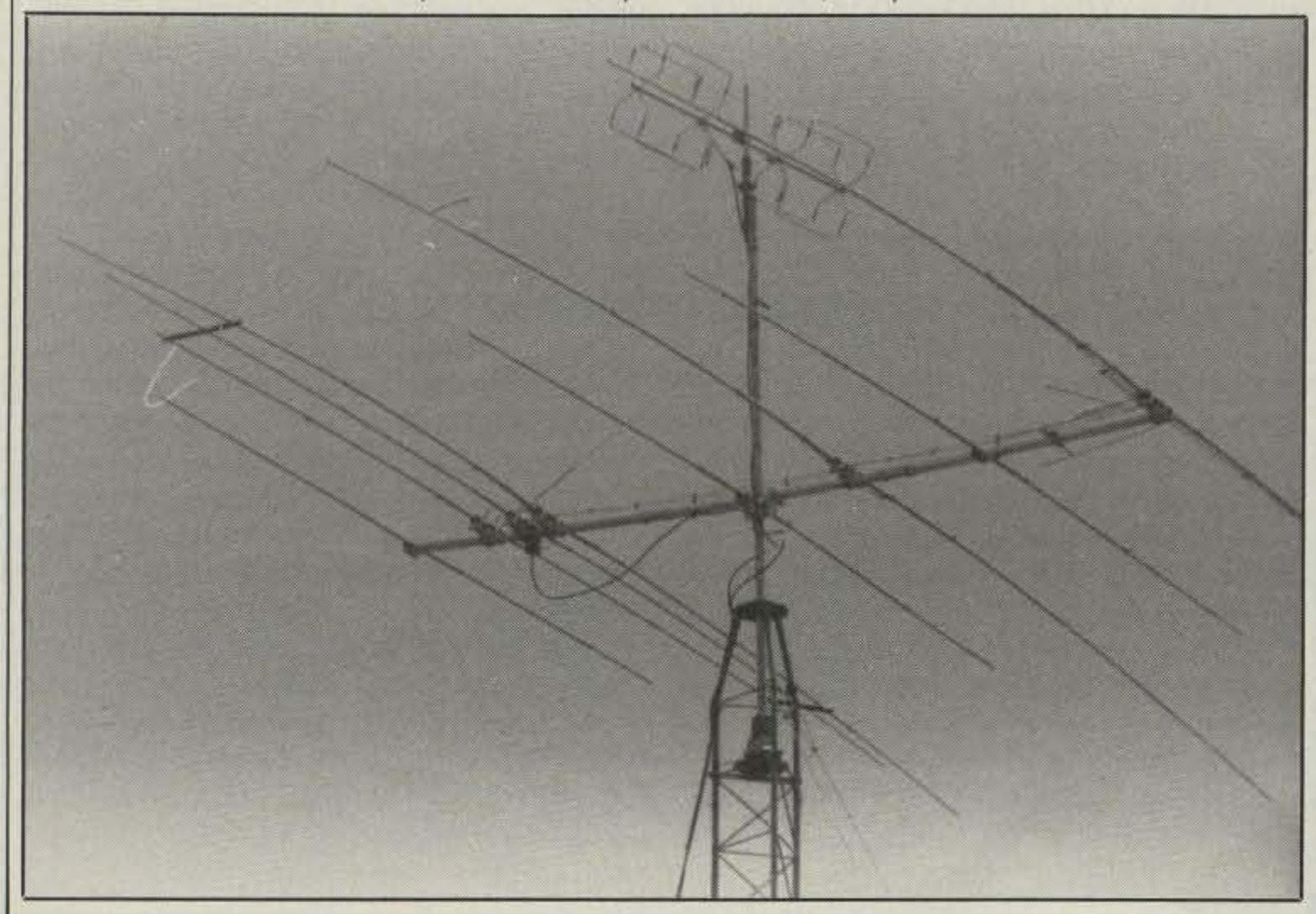
The instruction manual provides detailed drawings. It took me about five hours to put together the antenna, with another amateur helping for about two hours of that five. The XP506 weighs 66 pounds and has a wind loading area of 10 feet. What to me was interesting is that the gain claims for these antennas are completely realistic. As I said earlier, the manufacturer rates his gain over a half-wave dipole. For example, the XP406 model which is on an 8 foot boom has a stated gain 5 to 6 dB on 20 meters, and this is certain to be just about what it is. There is no doubt in my mind that the Sommer beam is in a class by itself when it comes to multiband arrays.

The real test of any antenna system is how it works in your station, and I have to mention one experience with this antenna. I got the antenna up on a Saturday and used it during the ITU DX contest. I noted immediately on 20 meters that the front-to-back was superb. I heard an old friend, W6BNX, Tiff, and called him to get some reports. While working him I heard a break, so I stood by for the breaker. The voice came back and said, "This is T32AN, Phil, on Christmas Island, and I wanted to tell you how well you are coming in here!" Needless to say, that makes a believer out of any antenna user. It is also a pleasure to have a rotatable dipole on 40 meters on top of my tower. I was also constantly amazed as to how low the SWR was across 20, 15, and 10. If I sound enthusiastic about the XP506, I am, and I will really be surprised if this system doesn't revolutionize multiband beam systems.

Here are the introductory prices for the various models: the XP406 is $514, the XP506 is $642, and the XP706 is $778. I didn't mention the gain on the XP706, but it is rated at close to 9 dB on 20 meters (over a dipole reference).

The manufacturer is Sommer GmbH, DJ2UT, Kandelstrasse 35, D-7809 Denzlingen, West Germany, and the beams are distributed in this country by H.J. Theiler Corp., P.O. Box 5369, Spartansburg, SC 29304 (803-576-5566). CQ

This shows the antenna installed on top of the tower. The back of the beam is to the right. That's a 2 meter Swiss quad on the top of the mast, not part of the DJ2UT beam.



The Second Annual CQ World-Wide VHF WPX Contest

Starts: 0000 UTC Saturday, July 19, 1986
Ends: 2400 UTC Sunday, July 20, 1986

I. Contest Period: 48 hours for all stations, single or multi-operator. Operate any portion of the contest period you wish.

II. Objectives: The objectives of this contest are for amateurs around the world to contact as many amateurs as possible in the alloted 48-hour period, to promote VHF/UHF activity, and to allow VHFers the opportunity to experience the enhanced propagation available at this time of year.

III. Bands: The 50, 70, 144, 220, 432, 902, and 1296 MHz bands may be used, as authorized by local law and license class.

IV. Type of Competition: 1. Single operator— (a) all band; (b) single band; (c) all band, low power; (d) single band, low power. **2.** Multi-operator—(a) all band; (b) single band. **3.** Portable (with temporary power source only). **4.** FM only. The "portable" category is for single or multi-operator stations. Low power is defined as 30 watts PEP output or less. All transmitters must be located within a 500 meter diameter, or within the property limits of the station licensee's address, whichever is greater. The antennas must be physically connected by wires to the transmitters.

V. Exchange: Callsign and "Maidenhead" locator grid square (4 digits, e.g., FN20). Signal reports are optional and need not be included in the log entry.

VI. Scoring: One point per QSO on 50, 70, and 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 902 and 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times the **total** number of prefixes (PX) worked. This differs from the scoring for the *CQ* HF WW WPX Contest, where a prefix counts only once regardless of band.

Example: W1XX works stations as follows:

37 QSO's and 12 PX's on 50 MHz
45 QSO's and 18 PX's on 144 MHz
26 QSO's and 10 PX's on 220 MHz
38 QSO's and 11 PX's on 432 MHz
6 QSO's and 3 PX's on 1296 MHz

W1XX's total score is: 234 QSO points × 54 PX's = 12636.

VII. Multipliers: The multiplier is the number of prefixes worked, additive on a band-to-band basis. A prefix is considered to be the three letter/number combination which forms the first part of an amateur radio callsign (N1, W2, WB3, K4, AA6, WD8, 4X4, DL7, G3, IT9, NP2, PY7, VK4, Y32, Y33, KT4, JE3, etc). **A station in a call area different from that indicated by his callsign is required to sign portable.** The portable prefix would be the number. **Example:** NV6O/2 counts as NV2; KT2B/VE3 counts as VE3; KR2Q/C6A counts as C6A; 4X4FN/W2 counts as W2. **Special-event, commemorative, and other unique prefix stations are encouraged to participate.**

VIII. Awards: Engraved trophies will be awarded to the top-scoring stations in each category and major geographic area where competition is indicated. Parchment certificates suitable for framing will be awarded to the top-scoring stations in each category and minor geographic area where competition is indicated. Certificates may also be awarded to other top-scoring stations who show outstanding contest effort. Major geographic areas include North America, Europe, and Japan as of this writing, but may be extended to include other areas as justified by competitive entries. Minor geographic areas include states (U.S.), provinces (Canada), countries (Europe), and call areas (Japan), and may also be extended to include other subdivisions as justified by competitive entries.

Logs must be postmarked no later than August 31, 1986 to be eligible for awards. Logs should be mailed to the *CQ* VHF WPX Contest, c/o S.C.O.R.E., P.O. Box 1161, Denville, NJ 07834, or to *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801.

C.O.M.B. BREAKS THE SATELLITE TV PRICE BARRIER!

KLM 8-ft. SATELLITE TV RECEIVER SYSTEM

HIGH PERFORMANCE! TOP NAME BRAND!

ABOUT THE MANUFACTURER

KLM introduced the FIRST satellite TV receiver system for consumers! They designed the FIRST programmable receiver. KLM is one of the largest in the industry and is a leader in advanced technology. Because they are concentrating efforts on new designs, KLM has allowed us to offer a quantity of these current 8-ft. models to the public at an unusually low price! It's a tremendous value!

FACTORY NEW! FIRST QUALITY!

COMPLETE, PERFECTLY MATCHED SYSTEM!

- *Designed for do-it-yourself installation!*
- *Fully programmable location of each satellite!*
- *All motorized!*
- *Automatic push-button selection of each satellite!*
- *Includes 120 feet of cable!*
- *Superior quality throughout!*

REMOTE CONTROL
Operates Aimer IV (shown at right). Push-button access to 64 programmed satellites. 6 pre-sets for your favorite programs.

Does not include metal support pipe.

INCLUDES ALL THIS, TOO!

SKY EYE X BLOCK RECEIVER!
Uncomplicated, easy operation! Fast fingertip selection of channel, polarity, audio tune. Relative signal strength meter lets you hit station right on the button. Separate AFC on/off selector allows precision tuning, even of weak channels.

INCLUDES blockdown converter (an expensive option on competitor's models). This splits signals so 2 TV sets in your home can "tune in" on 2 different channels of same satellite at same time. However, you need another receiver (available from regular KLM dealers) for the second TV set.

HORIZON TO HORIZON MOUNT
This special mount delivers 180° range for maximum degree of "dish" rotation for access to TV satellites in western hemisphere. 120 feet of cable also included.

Fully Programmable AIMER IV REMOTE "DISH" POSITIONER
Microprocessor controlled for pushbutton access to 64 pre-programmed satellite locations. Six pre-sets for favorite satellites. Automatically positions "dish" and channel skew (polarity). Battery backup for three-month memory retention in case of power failure of for unplugging system during vacations. **Parental Lockout prevents** children from viewing restricted channels.

HOW TO SELECT A PROPER SITE
Stand in your yard, look due South and side to side. You should have an unobstructed view of the sky. Tree branches and power lines diminish quality of reception.

It opens up a vast new world of TV entertainment! MORE sports! MORE movies! MORE of everything you like to watch! And it provides superior reception capabilities!

The KLM 8-ft. Satellite TV Receiver system picks up signals from more than a dozen communications satellites in the sky. This opens up over 100 channels of TV viewing, with a multitude of programs. And the KLM system provides outstanding reception capabilities throughout the entire 48 states!

PERFECT FOR SPORTS FANS! Enjoy much more sports action and thrills than ever before! You'll literally be "in heaven" with the vast selection of football, baseball, basketball, hockey and many other exciting televised sporting events. Plus, no more "blackouts".

HUGE VARIETY OF ENTERTAINMENT. Watch popular new films and plenty of classic "oldies" on the movie channels. Keep up with fast-breaking national and international events, any time of day, on all-news networks.

Get important investment "tips" and information from the financial/business channels. View provocative Adults Only programs. Delight in video entertainment of top performers on music channels for rock, pop, country, classical, etc.

PLUS, there are entertaining and educational channels specifically for children. Religious and cultural channels. French and Spanish networks. The list goes on and on! And with each new TV satellite placed in the sky, your exciting world of home entertainment keeps growing LARGER and LARGER!

IDEAL FOR RURAL AREAS! If TV reception is poor or the variety is very limited where you live, you're in for a HUGE DELIGHT! With the KLM system, reception is as good as in a big city. And the variety is huge!

GREAT FOR URBAN AND SUBURBAN AREAS! With the KLM system, you can still pick up all your usual local stations. PLUS, you get greatly expanded selection from all the satellite channels. There's a huge world of viewing pleasure in store for you. Up to 100 or more TV channels are available with the KLM system!

DO-IT-YOURSELF INSTALLATION! You don't have to be an electronics "whiz" to install the KLM system. Components come pre-assembled, except for the 8-ft. "dish." Need: 3½" outside dia. support pipe, bag of cement mix and your own TV. KLM has a Toll-Free number to call just in case you need assistance. The "dish" is designed to withstand high winds.

AN EXCELLENT VALUE! Don't be fooled by someone else's "low" price on a "dish" that is SMALLER than ours...NOT as high-tech...or is INCOMPLETE and requires costly purchases of additional components. With our KLM 8-ft. "dish" you get a complete, superior quality system from a leader in the industry...at a remarkably low closeout price!

One year limited factory warranty on parts and labor.

Mfr. Suggested List Price **$1900.00**

ENTIRE SYSTEM Closeout Price **$999**

Item H-1044-5958-004
F.O.B. Milwaukee, Wisc. metro area
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☐ My check or money order is enclosed. (No delays in processing orders paid by check, thanks to TeleCheck.)

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World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

April Special: A Double Feature

Your response to this column's wide variety of topics has been very encouraging, and this month presents an opportune time for returning those compliments. Thanks! It's gratifying to see such progressive-minded interest in today's age when many individual and social standards are tailspinning toward record low levels. One can only surmise that radio amateurs are self-motivated folks dedicated to enjoying the latest technical advancements and doing their part for the betterment of mankind along the way.

We've pioneered and continue pioneering new areas of electronics and communications, changes are a natural part of our lifestyles, and we're capable of pursuing areas dubbed "profit risks" by commercial firms. In fact, we continue reflecting our proud heritage to such an extent that our actual existence is now being challenged by premature extinction. Statements of the previous nature are being heard/read more and more often today, but are they really sinking in with each and every one of us? Might we be too busy in our own world, feel we've individually served our (nondefined) service, or expect newer members to take the challenge themselves? Maybe we unconsciously think the other continents' amateur population can prevent dissolving amateur radio in the U.S. alone, or manufacturers will continue producing gear for our dwindling market. Maybe we best start thinking logically rather than personally.

Considering the U.S. situation overall, we seem to have two choices: continue the status quo and become a classic but extinct species like the American Indian or buffalo, or change our criteria to encourage the rank's replenishment/survival. Amateur radio within the U.S. may continue through our own lifetime, true, but what purpose will that serve if other generations can't appreciate it? Theory-only licensing may seem like an ultimate sacrifice, but I'm not sure that even that step would attract enough of today's most motivated youngsters. It's doubtful at best, but it's all we have to go on, and "tomorrow" is too late for instigating those changes.

One of the most logical ideas I've heard for glamorizing amateur radio to newcomers is including limited SSB privileges for Novices. Visualize, for example, expanding the presently existing Novice allocations on 10 and 15 meters an additional 50 kHz, then dividing those allocations between CW and SSB. These bands could easily spare 50 kHz for our own survival, and that glimpse of worldwide voice communications—that aural encouragement to delve further, try mobiling, demonstrate amateur radio's excitement to nonamateur friends—and that fresh retail market would cumulatively help preserve our ranks. The idea is assuming any serious person can master five words per minute Morse, and then dangling a BIG carrot. That idea, plus encouragement for more technicians to experience OSCAR 10, both evolved through visions from my XYL, Sandy, WB4OEE. What's your opinion?

An especially rewarding spinoff of writing this monthly column is the favorable words and letters we receive from you, the readers. We also receive a number of inquiries each month concerning new items and/or products featured in this column or our various *CQ* reviews. Your letters are always welcome, but most of those availability and cost-related questions can be answered immediately in the ad section of this and other magazines. In fact, our amateur radio magazines are closely akin to a monthly hamfest via mail. The ad sections are a "main auditorium" glamor area with plenty of information and prices plus toll-free numbers for personal deals. The feature articles resemble forums and special discussions. The want ads are boneyards or fleamarkets, and some good deals always await sharp-eyed readers. Receiving 15 to 20 amateur radio magazines each month is like a hamfest every day. Try it yourself and see!

Many of you have asked if I'm personally involved in all the areas highlighted in this column. Sure! Amateur radio is an unlimited resource of fascinating pursuits, and I'm out to enjoy my fair share. Aren't you? Consider the facts: if amateur radio's appeal in one area ever wanes, explore a new area rather than purchase new gear to continue a declining style or interest. You can even trade special-interest-type gear to continue those explorations on a limited budget. Assuming one special interest area per year, there's at least 30 years of excitement awaiting your investigations. I, personally, enjoy early morning DXing on 20 or 160 meters, OSCAR 10 during the morning or evening, 30 or 12 meters mobile CW, plus SSTV, RTTY, QRP and SWLing at night, and other aspects (such as microwaves) on a eclectic basis. I continue, also, frequenting 14.180 kHz ±QRM Sundays between 2230 and 2330 GMT to enjoy exchanging friendly words with old friends. If you're around then, give a call and let's exchange greetings.

We continue taking our cues for this column's directions from your letters, and some interesting topics are being planned for upcoming issues. We'll soon be featuring more news/information on OSCAR satellites, Slow Scan TV, printed-word communications, and more SWL activities. Another article on classic keys and bugs is also in the works. Meanwhile, why not drop me a note with your own comments and suggestions of topics you would like featured in future columns. New gear notes? Nostalgia? Revitalizing classic gear? EME? You've an opinion. Let's hear it!

Microwaves: Are They Your Fancy?

Another one of our special-interest projects reached finalization a couple of months ago, and I would like to share those pleasures with you. The first printed copies of my *Microwave Communications Handbook* (TAB #1594) were released by TAB Books, and they should be available nationwide by this month. What's the attraction of microwaves and how does one actually use them (especially if they're isolated from other microwave pioneers)? The three most popular microwave bands are 1.2, 2.3, and 10.0 GHz, and they're particularly useful for point-to-point communication of signals too broadband for lower frequencies. The 1.2 GHz band is especially known for its use in Phase III OSCAR satellite operation. Although OSCAR 10's mode L system (1.2 GHz uplink, 70 cm downlink) suffered sensitivity-reducing damage after launch, upcoming satellites promise to make this band OSCAR's most attractive range. Small outdoor antennas and relatively low-power amplifiers plus a good 70 cm receiver will provide fully reliable worldwide communications via satellite. This concept is presently being demonstrated daily on OSCAR 10 mode B and, "crippled system" withstanding, on mode L. The 1.2 and 2.3 GHz bands are also popular for ATV. Again, associated low-power gear and small antennas make these ranges ideal for portable work such as special-event coverage.

Equipment-wise, ICOM leads the way on 1.2 GHz with their all-mode IC-1271 transceiver. The unit looks like a "twin"

Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

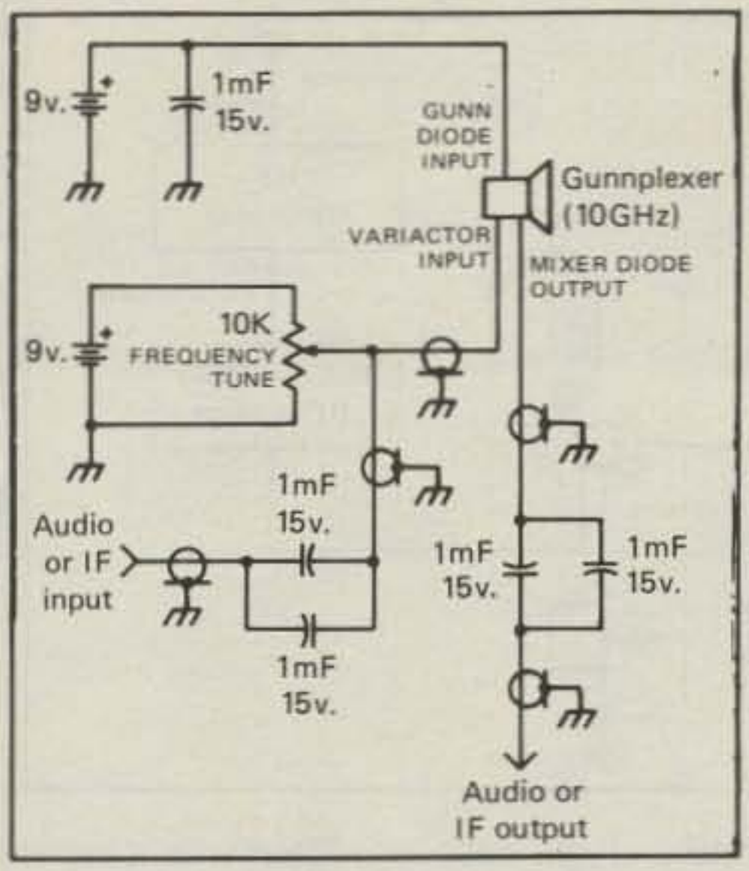


Fig. 1– Simple "getting started" means of setting up one or more Gunnplexers for 10 GHz operation. Modulating signal may be audio, video, or a full amateur HF band (see text). Greatest RF output (and maximum range) coincides with narrowest bandwidth modes. The AF/IF output from a single Gunnplexer will increase noticeably when its transmitted energy reflects off a distant auto or metal building.

to ICOM's 271, 471, or 751 transceivers. An optional ATV adapter is available, for Fast Scan TV operations with the 1271. Another very good source of ATV, 1.2 GHz, and 2.3 GHz gear is PC Electronics of 2522 Paxson, Arcadia, California 91006. Owner Tom O'Hara, W6ORG, is well known and respected for his developmental work in these areas.

Our 10 GHz band is a unique frontier that can be pioneered on an individual or group basis, as situations warrant. High amateur population areas, especially those with relatively flat terrain, are ideal for 10 GHz group activities. Microwave projects of this nature are also dandy club revitalizers. Naturally there are DX and miles-per-milliwatt records to challenge and rechallenge, and the vast amount of bandwidth available at 10 GHz encourages all kinds of exotic modes development. One example is simultaneously relaying three or four full channels of amateur TV activity which could be received and tuned in a "wireless cable" manner among ATV/microwave operators. Another example involves setting up a microwave mini-network which would be totally free of local VHF/UHF crowding or "eavesdropping" by general scanner owners.

How might a single isolated amateur enjoy the benefits of 10 GHz operation? A single Gunnplexer-type unit could form the basis for a microwave intruder alarm or be rigged to monitor auto traffic flow on nearby main roads. The 10 GHz band is notorious for bouncing off objects of various densities. In fact, a personal weather radar setup could be assembled around an old television and a single Gunnplexer. The horizontal sweep across a TV screen transgresses 53 microseconds, and a 10 GHz signal travels one mile round trip (if reflected off storm clouds) in 12.36 microseconds. That equates to roughly a 4.5 mile range. Horizontal oscillator pulses from the TV could trigger a Gunnplexer modulator circuit (and TV sweep), while the Gunnplexer's IF output could drive the TV's (rewired) video amplifier to create bright intensities according to echoes. An outdoor-mounted Gunnplexer could be rigged on an oscillating fan base to provide direction information. Your imagination can expand the idea from here.

Amateurs livingin a high noise or poor HF reception area might find 10 GHz cap-

abilities quite attractive for improving DX capabilities. Visualize, for example, placing an optimum-size receiving antenna for a favorite HF band along with a multistage broadband RF preamp and Gunnplexer atop a nearby hill. The preamp's output (14.0 to 14.3 MHz, for example) could connect to the Gunnplexer's IF input and be relayed to the home setup. There another Gunnplexer could receive the wideband 10 GHz signal, its IF output (14.0 to 14.3 MHz) repreamplifed and applied to the auxiliary antenna terminals of the main station's HF transceiver. These are only some brief ideas to whet your creative thinking. They're *not* finished products that I have available for SASE's, etc. Remember, this is a frontier, and each pioneer can pursue his/her own path of interest.

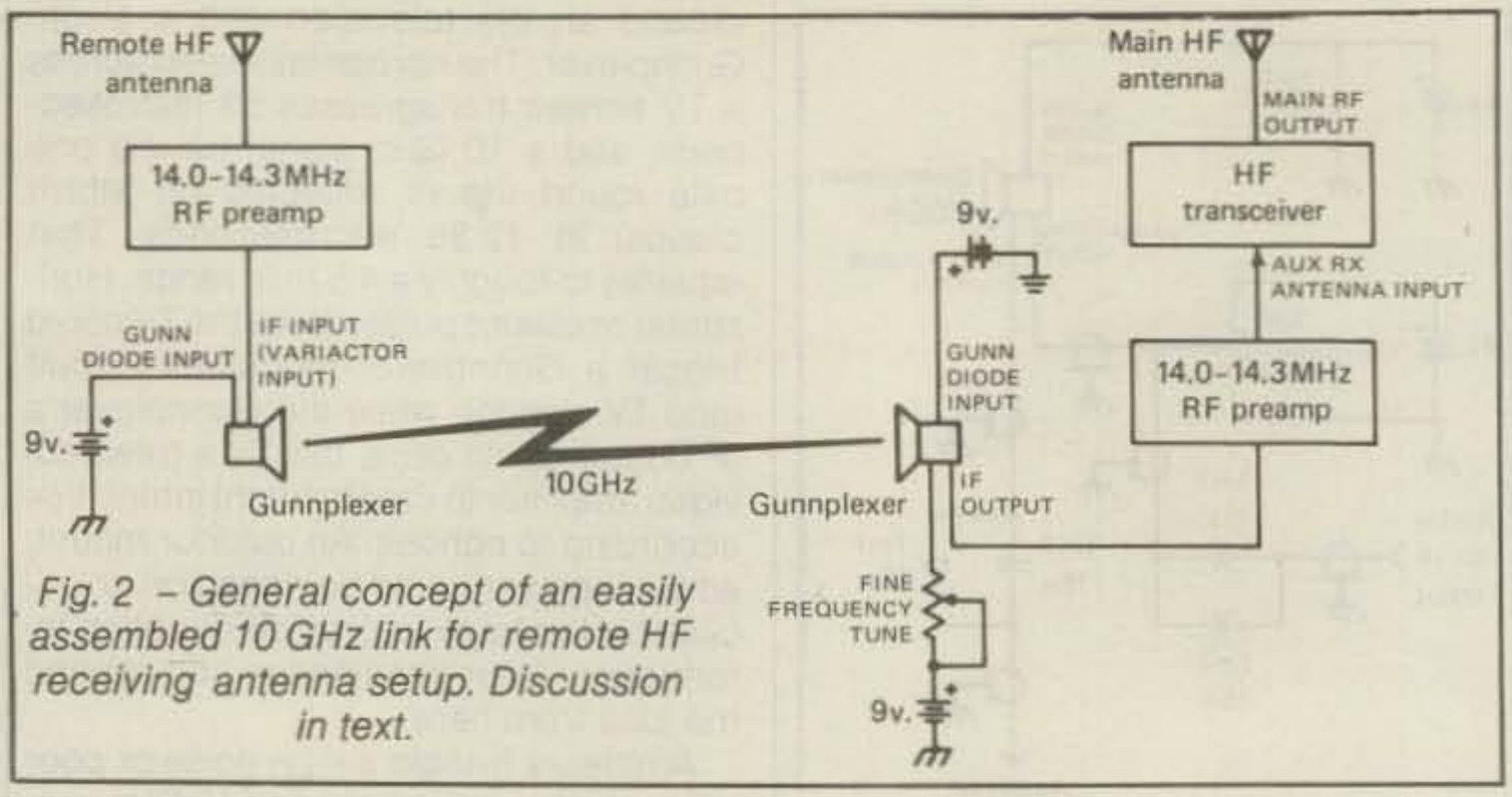


Fig. 2 – General concept of an easily assembled 10 GHz link for remote HF receiving antenna setup. Discussion in text.

The Gunnplexers I described are small 10 GHz transmitting/receiving units built into a single case and fitted with a high-gain feedhorn. They are available singly or in pairs from Advanced Receiver Research, Box 1242, Burlington, Connecticut 06013. Other types of 10 GHz transmitter or receiver sections can be spotted by sharp-eyed amateurs scrutinizing the ad sections of various magazines. Half the challenge of microwaves *et al* is locating usable goodies and securing applicable information. Patience and perseverance are virtues here.

Once a Gunnplexer-type setup is acquired, its general hookup and tuning procedure is a fairly simple matter. Operating voltages are applied to the Gunn diode and variactor terminals (11 and 9 volts, typically), the modulating signal (or signals) is applied to the IF input, and the received signal (or signals) is taken from the IF output terminal. The exact IF frequency is the 10 GHz frequency difference between Gunnplexers and can be "tweaked" slightly by variactor voltage adjustments. When first setting up any microwave system for intercommunications, I heartily recommend using an auxiliary 2 meter simplex link for coordinating actions and reducing variables. This procedure can ensure one location's dish is held steady while the other is position-tweaked. The process can then be reversed. Likewise, one microwave unit should be held frequency stable while the other unit's frequency is tuned for synchronization. Use these ideas along with general electronic "common reasoning," and your experience with microwaves should be quite rewarding.

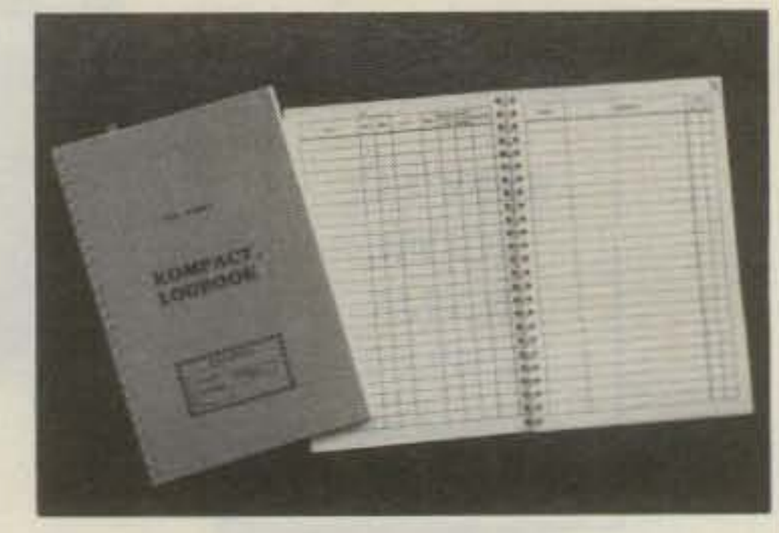
Conclusion

If it wasn't immediately apparent, the overall thrust of this month's column was continuing amateur radio's proud traditions and continually expanding our unlimited horizons. All of us can't be involved in all areas and each of us may only come in contact with a few potential newcomers, but together we form one of communications strongest and most respected backbones. Pioneering new areas and recruiting new amateurs helps ensure that those qualities continue.

CQ SHOWCASE

W4MPY Kopact® Logbook

W4MPY has announced a logbook with a unique format designed for ease of use and quick transfer of QSO information to a QSL card. The 5½" × 8½" logbook opens to an 8½" × 11" size for use. A "clip corner" is featured for finding the correct page. The exclusive "card-keyed" format arranges information in the same sequence as is traditionally used in most QSL report blocks. Space is allowed for all necessary QSO information. Nonessential info is deleted to leave extra space for comments. A total of 1250 QSOs can be recorded in one book.



The Kompact® Logbook is priced at $2.85 plus $1.50 first-class shipping. For more information, contact QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841, or circle number 101 on the reader service card.

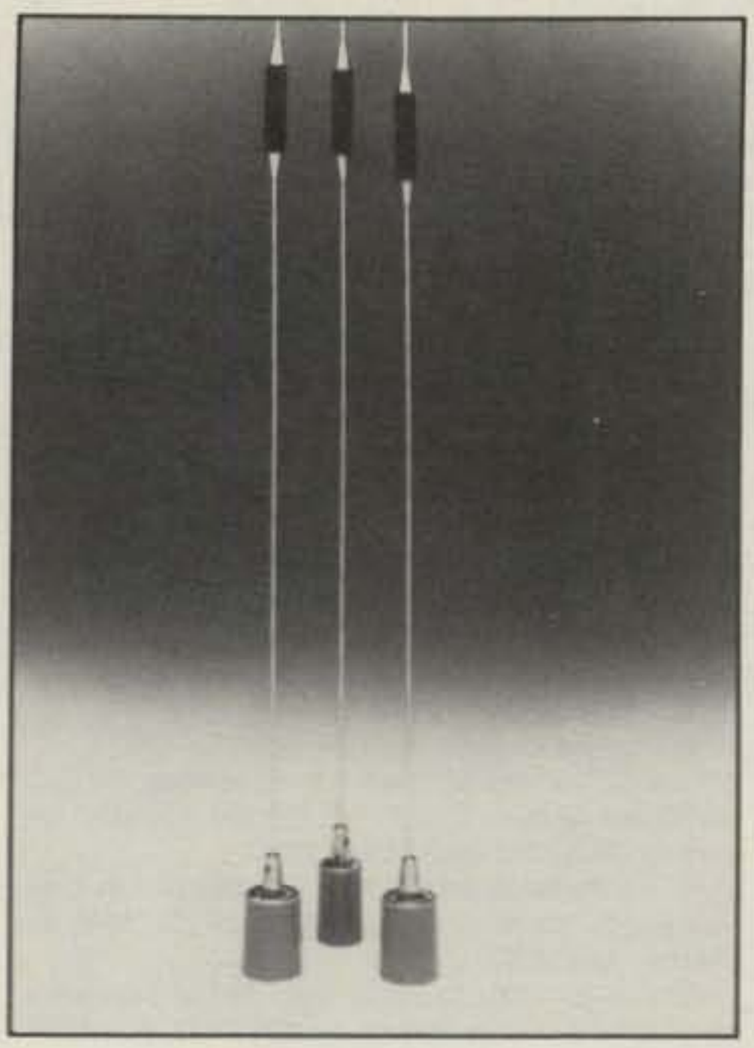
Nemal Cable and Connector Selection Guide

Nemal Electronics International has published a guide for the selection of electronic wire, cable, and connector products. The 32-page guide contains detailed specifications and illustrations of over 550 items, along with cable construction and performance charts, and a complete tooling cross reference.

Among the 32 product categories listed are fiber optic cables and connectors, plenum cables, satellite control cables, and numerous RF and data connector types. Nemal's new *Cable and Connector Selection Guide* is available at no charge to all interested business concerns, and to individuals at a cost of $4.00. Contact Nemal Electronics, 12240 NE 14th Avenue, North Miami, FL 33161, or circle number 102 on the reader service card.

Larsen Dual-Band Mobile Antennas

Larsen's dual-band mobile antennas incorporate a half-wave element for the 2 meter (144–148 MHz) amateur band and colinear elements for the 70 cm (440–450 MHz) amateur band. One antenna serves



both bands. The self-resonant design that doesn't require a ground plane allows mast applications for boats and base stations with standard Larsen BSA-K hardware. For more information, contact Larsen Electronics, P.O. Box 1799, Vancouver, WA 98668, or circle number 103 on the reader service card.

MFJ Triple-Output Lab Power Supply

The MFJ-4002 Triple Output Lab Power Supply offers two variable 1.5 to 20 VDC outputs at 0.5 amp and one fixed 5 VDC output at 1 amp. It's designed for heavy-duty commerical use, with plenty of voltage and current for both analog and digital circuits. Separate transformers are used for completely isolated outputs. This allows the outputs to be connected in series or parallel for higher voltage or current. It is short-circuit protected, has line regulation of typically 0.1%/V and load regulation of typically 0.1%, and has low ripple. Two lighted 3 inch precision meters are provided for monitoring voltage and current simultaneously.

The MFJ-4002 is made of heavy-gauge aluminum. It measures 12"×3"×6". The MFJ-4002 can be ordered from MFJ for a 30-day trial period (it can be returned for a full refund, less shipping). The unit carries a full one-year unconditional guarantee, and is priced at $149.95 (plus $6.00 shipping and handling). For more information, contact MFJ Enterprises, Inc., 921 Louisville Road, Starkville, MS 39759, or circle number 106 on the reader service card.

ANNOUNCING:

• **The Foundation for Amateur Radio Scholarships** - This organization plans to award 21 scholarships for the academic year 1986–87. Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. The awards range from $350 to $900. For more information and an application, send a letter or QSL/postcard, postmarked prior to May 31, 1986, to FAR Scholarships, 6903 Rhode Island Ave., College Park, MD 20740.

• **Atlanta Radio Club Scholarships** - Two scholarships of $1250 each will be awarded to licensed radio amateurs graduating from high school and entering an accredited college or university for the first time as freshmen in 1986. For application blanks and more information, write to Phil Latta, W4GTS, 259 Weatherstone Pkwy. NE, Marietta, GA 30067.

• **Statue of Liberty QSL** - This 8" × 10" commemorative QSL will be available upon receipt of a QSL and two first-class stamps from any station contacted during 1986. WA2OQJ can be found operating using RTTY on 20 meters and 146.55, and packet on 145.01–145.03 MHz. QSL to Al La Vorgna, WA2OQJ, 21 Kuhl Ave., Hicksville, NY 11801.

• **Los Altos Hills Fleamarket** - This fleamarket/boneyard sale will be held at Foothill College, Los Altos Hills, CA from April–September on the second Saturday of every month. Seven a.m. sellers, 7:15 a.m. buyers. Talk-in on 145.27 or 147.570 simplex. FCC exams 408-255-9000.

• **Southeastern Virginia Exam Schedule** - May 3, South Peninsula ARC, contact Al Evans, N4IIC, P.O. Box 4128, Hampton, VA 23664. June 7, Portsmouth ARC, contact George Parsons, WB4BAB, 4800 Manor Ave., Portsmouth, VA 23703. To apply, send form 610 and copy of license with $4.25 check, payable to ARRL/VEC, to contact person. Enclose SASE for confirmation. Cutoff date for application is 30 days prior to test.

• **Special-Event Station KC3TX** - The Columbia-Montour ARC will sponsor this special event to commemorate the bicentennial of the City of Berwick, PA. Operation will be in the General phone portion of the 20 and 40 meter bands from 1700–2400Z on April 12. Send QSL and $1.00 for certificate to CMARC, P.O. Box 930, Berwick, PA 18603.

• **Holiday-in-Dixie QSO Party** - This event will take place on April 12 from 1800–2300Z using normal contest frequencies on 40 meters and 20 meters and if conditions permit on 15 meters and 10 meters. Primary mode is SSB (7230, 14280, 21375, 28585). CW on 40 meter Novice and 15 meter Novice band about 25 kHz up from low end of bands. Mail QSL and SASE (for 8½" × 11" certificate) to: HID QSO Party, P.O. Box 4842, Shreveport, LA 71134-4842.

• **Atlanta, Georgia** - Metro Atlanta Telephone Pioneers ARC will operate W4OTA April 18–20 as part of A Taste of Atlanta 1986. Operation Friday and Saturday 1500Z–0300Z, Sunday 1700Z–2300Z. Suggested frequencies SSB 7.285, 14.285; CW 7.055, 14.055; FM 144.81/41, 449.150/444.150. For special-event QSL send SASE with log info to MATPARC/Taste of Atlanta, John C. Parker, P.O. Box 54017, Atlanta, GA 30308.

• **Smithfield, NC** - The Johnston ARS in celebration of the 2nd annual Smithfield Ham and Yam Festival will operate KA4HAM from 1400–2400Z April 19–20. Operation will be in the General frequencies 3.855, 7.230, 14.255, and the Novice frequencies of 3.708, and 7.110. For a special QSL card and certificate send a large SASE to Mark Gibson, N4MQU, P.O. Box 2084, Smithfield, NC 27577.

• **Arbor Day** - Special-events stations will operate from Nebraska City, NE during the Arbor Day celebration in the General portion of phone and CW bands on 80–10 meters from 2400 UTC April 21 to 0600 UTC April 27. For a certificate from the Nebraska City ARC, send an SASE and QSL to Nebraska City Radio Club, P.O. Box 278, Nebraska City, NE 68410. (SWLs can also participate.)

• **MIT Volunteer Exams** - The MIT UHF Repeater Association and MIT Radio Society offer monthly radio exams, all classes Novice to Extra. The next two will be given on April 23 and May 21 at 7 p.m., MIT Room 1-134, 77 Mass Ave., Cambridge, MA. Reservations are requested two days in advance. Contact Ron Hoffman at 617-253-5820/646-1641, or Craige Rodgers at 225-6616. Exam fee is $4.00. Bring a copy of current license (if any), two forms of picture ID, and a completed form 610 available from the FCC in Boston (223-6609).

• **HB0 DXpedition** - The Wiesbaden ARC, an ARRL affiliated club from West Germany, will be on the air from Liechtenstein during the club's eleventh annual DXpedition from 22 May through 2 June. The club will be operating the HB0/DA1WA callsign on all bands using both CW and SSB. Each contact with DA1WA counts heavily toward the club's URKUNDE (award) Certificate. Information may be obtained from the QSL managers. U.S. and Canadian stations QSL (with 22 cent SASE) via regular U.S. mail (22 cents) to Steve Hutchins, Box 4205, APO NY 09633-5374. All others QSL via Hugo Jakobljevich, Im Weinberg 10, D-6200 Wiesbaden-Auringen, West Germany.

• **Kankakee Hamfest** - The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 4th. FCC booth, large fleamarket and many exhibitors. For further info contact: K9NR, Don Kerouac, 1377 Circle Dr., Kankakee, IL 60901.

• **The following hamfests, etc., are slated for April:**

April 5, **Columbus ARC Swapfest,** Columbus, IN. Contact Chuck Roberts, WD9DWI, 2950 So. Lake Dr., Columbus, IN 47203 (812-579-6576).

April 5, **Rochester Area Hamfest,** Rochester, MN. Contact RARC, c/o WB0YEE, 2253 Nordic Ct. NW, Rochester, MN 55901.

April 5–6, **ARRL Nebraska State Spring Convention,** Kearney, NE. Contact Midway ARC, P.O. Box 1231, Kearney, NE 68847.

April 6, **Madison Swapfest,** Madison, WI. Contact MARA, P.O. Box 3403, Madison, WI 53704 (608-222-4744).

April 6, **Greater Baltimore Hamboree and Computerfest,** Timonium, MD. Contact Greater Baltimore Hamboree, P.O. Box 95, Timonium, MD 21093-0095 (301-561-1282).

April 6, **SEMARA Hamfest Swap & Shop,** Grosse Point Woods, MI. Contact SEMARA Hamfest, P.O. Box 646, St. Clair Shores, MI 48080, or call Fred Lewis, NK8M, at 313-881-0187.

April 6, **Clarksville Amateur Transmitting Society Swapfest,** Clarksville, TN. Contact CATS, 1550 Armistead Dr., Clarksville, TN 37042 (615-648-3657).

April 6, **Walla Walla, WA Swapmeet,** Walla Walla, WA. Contact W7DP, P.O. Box 321, Walla Walla, WA 99362.

April 11–13, **Missouri State ARRL Convention,** Kansas City, MO. Contact PHD ARA, P.O. Box 11, Liberty, MO 64068-0011 (816-781-7313).

April 12, **Flemington, NJ Hamfest,** Flemington, NJ. Contact Cherryville Repeater Assoc., Box 308, Quakertown, NJ 08822.

April 12, **Lawton Fort Sill ARC Swapfest,** Lawton, OK. Contact Don Hagler, K5CKQ, 912 Bell St., Lawton, OK 73507.

April 12, **Putnam County ARC Hamfest & Auction,** Greencastle, IN. Contact Kent Douglas, K9JCR, RR #4 Box 586, Greencastle, IN 46135 (SASE) (317-672-8237).

April 13, **Southern Alleghenies Hamfest,** Bedford, PA. Contact Gay Rembold, W3DFW, 949 Winifed Rd., Cumberland, MD 21502, or call 301-724-0674.

April 13, **Northwest Oklahoma Eyeball & Swapmeet,** Mooreland, OK. Contact Gordon Richmond, NR5L, Rt. 1 Box 12, Mooreland, OK 73852, or call 405-994-5394.

April 18–20, **Midwest Convention & Hamboree #8,** South Sioux City, NE. Contact Al Smith, W0PEX, 3529 Douglas St., Sioux City, IA 51104.

April 20, **Tailgate Computer & Amateur Radio Fleamarket,** Cambridge, MA. Contact MIT Electronics Research Society, W1GSL, P.O. Box 82 MIT Br., Cambridge, MA 02139, or call Jamie at 617-262-5090.

April 20, **Moultrie ARK Hamfest,** Mattoon, IL. Contact MARK, P.O. Box 79, Sullivan, IL 61951.

April 25, **Dayton-Cincinnati Chapter Quarter Century Wireless Assoc. Banquet,** Dayton Hamvention, Dayton, OH. Contact Bob Dingle, KA4LAU, 657 Dell Ridge Drive, Dayton, OH 45429.

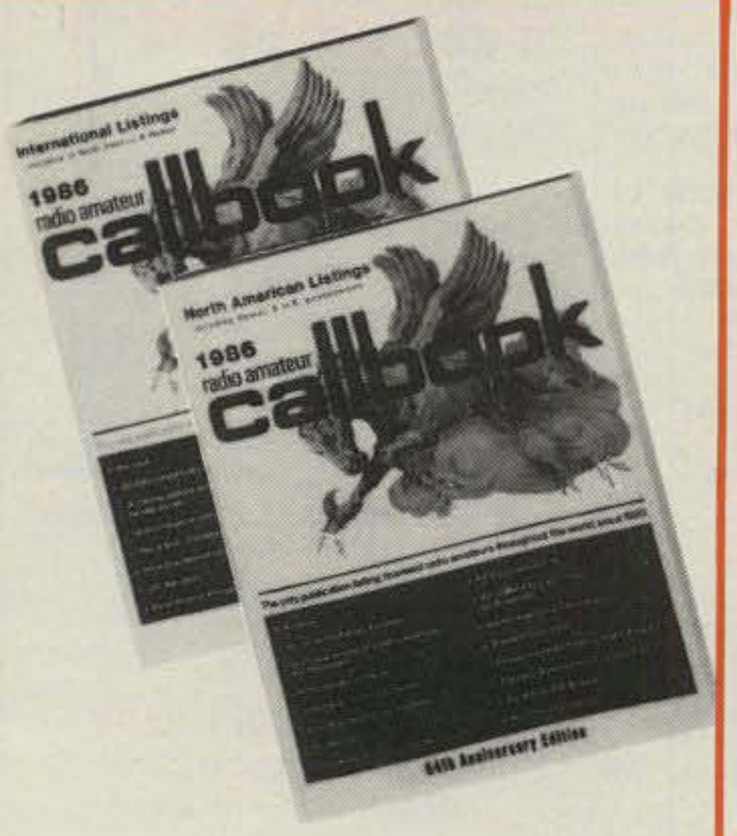
April 25–27, **Dayton Hamvention,** Dayton, OH. For information call 513-433-7720.

April 26, **Montachusett ARA Fleamarket,** Fitchburg, MA. Contact Montachusett ARA, 21 Burnap St., Fitchburg, MA 01420.

April 27, **Computer Central,** Itasca, IL. Call 312-940-7547.

May 18, **Portage Hamfair,** Randolph Fair Grounds, Ravenna, OH. Call 216-274-8240.

1986 CALLBOOKS



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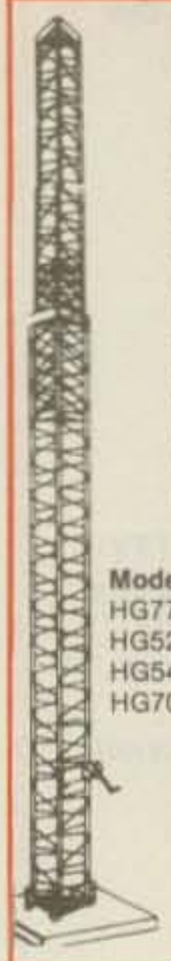

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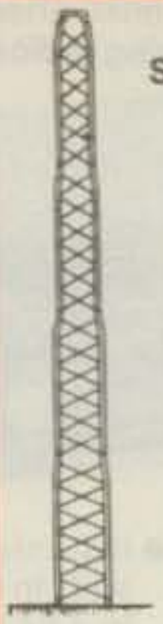

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HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

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LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
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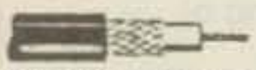

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
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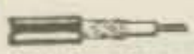
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X



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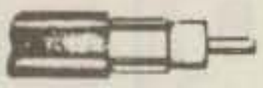
- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10 MHz	30 MHz	150 MHz	450 MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™



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Solid Copperweld 12 ga. $.12/ft 14 ga. $.10/ft
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64BS 4-el 6-mtr Beam	
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14 AVQ 40-10 mtr vertical	
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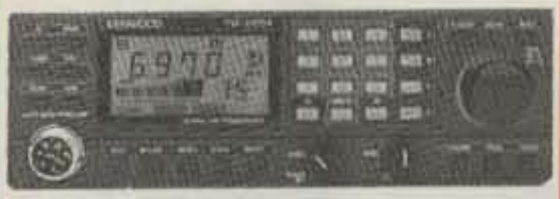

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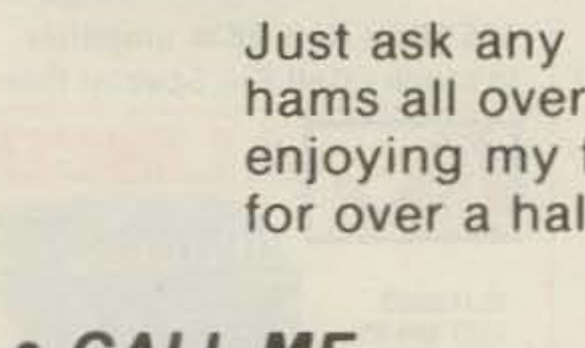

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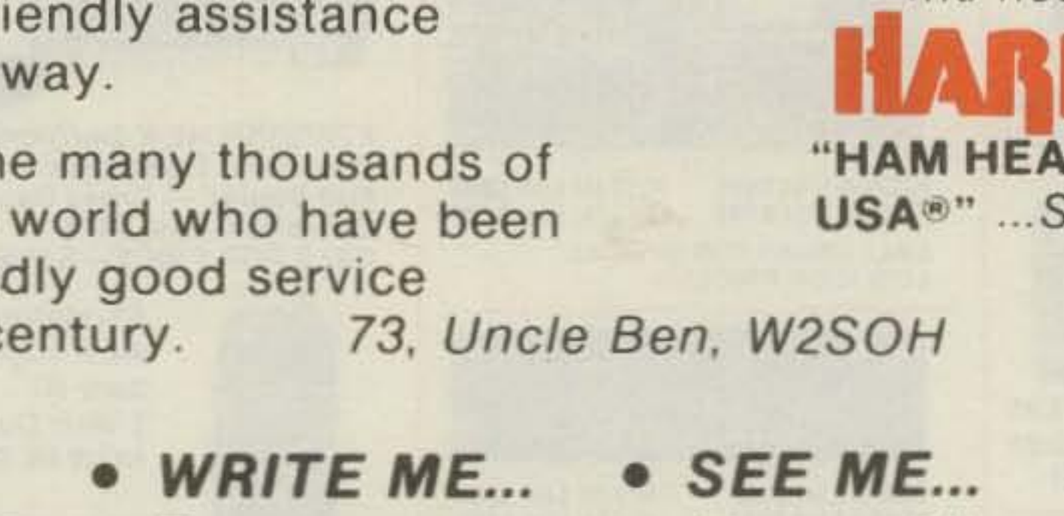

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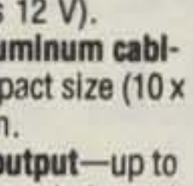

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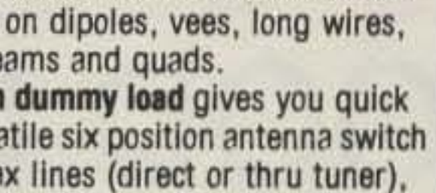

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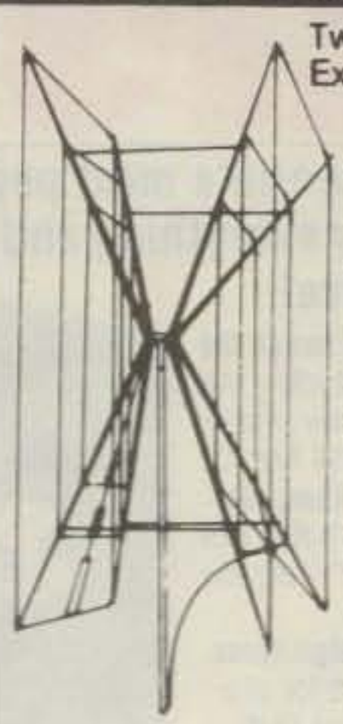

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CIRCLE 155 ON READER SERVICE CARD

Here's some sage advice to heed before you put up that new antenna or when you move to that new neighborhood.

LOVE THY NEIGHBOR

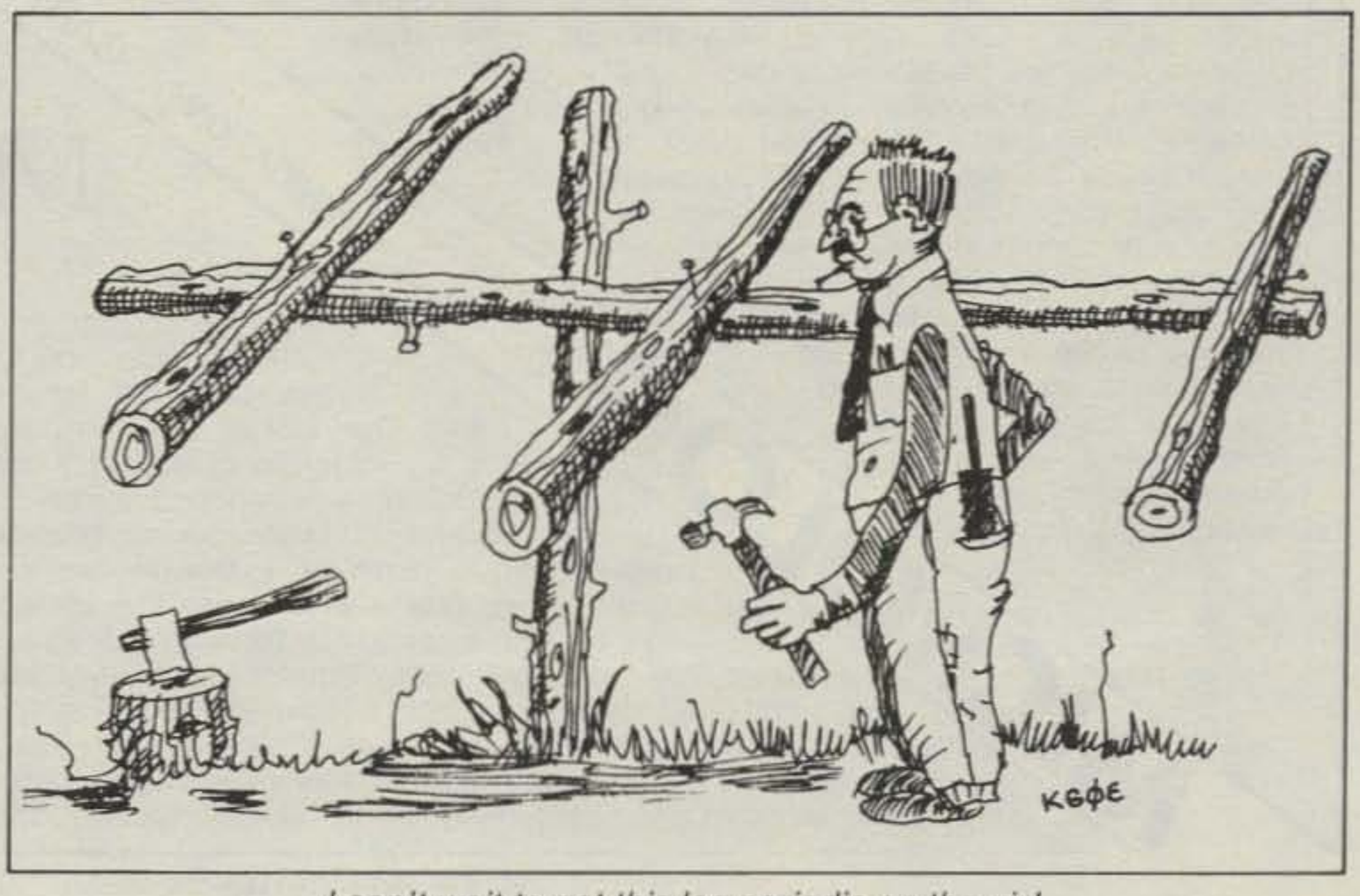
BY JAMES CARROLL*, WA3INA

A few years ago I wrote an article entitled "The Cows, The Coax, and I" which appeared in this magazine. Having just moved to an apartment in the country, I wrote about the joys and disappointments of DXing from an apartment. From the apartment 304 countries were worked with a variety of dipoles, verticals, and eventually a triband beam at 25 feet. I did have a problem with TVI, but luckily the other tenants were single and very seldom at home. Of course, even a slight TVI problem during the Superbowl or World Series can make usually friendly tenants very hostile.

After five years in the apartment, we were finally able to get into our first house. A bit of apprehension crossed my thoughts in the form of two problems: first, after having a large backyard at the apartment, would I be able to squeeze my antennas into a smaller one, and second, with new neighbors so close, would I have to battle TVI? I decided from day one that I'd better have a plan of attack, or my DXing days might be over.

The first thing I did when I moved was to introduce myself and my hobby to my new neighbors. Trying to accentuate the positive, I explained that in some cases there *might* be some TVI; the key word here is "might." I never inferred that there definitely would be interference. I also let them know that I cared about their right to watch TV in peace, and that any steps that could be taken to cure a problem would be taken. I think I gained a real inroad here.

As my tribander was still sitting disassembled in the garage, I put up my trusty old vertical. My wife watched our TV while I ran the rig. The result—picture clear, no TVI. Happy days were here again, or at least so I thought. The next day, however, my wife heard one neighbor tell my other neighbor about the interference on her TV. I went next door to talk to my neighbor and ask her about the severity of the interference. She told me it was not very bad, but it came in the form of wavy little lines across her screen. Having been through this before, I had a spare high-pass filter which she let me attach to her TV set. I asked her to watch the set while I operated my rig. When I came back and asked her how the picture looked, she asked me when was I going to start testing. It looked like I had solved the problem and made a friend to boot. On the way out the door, she asked me what she owed me for the filter. I told her as long as she watched her TV in peace, I'd call it even. Talk about a nice neighbor!

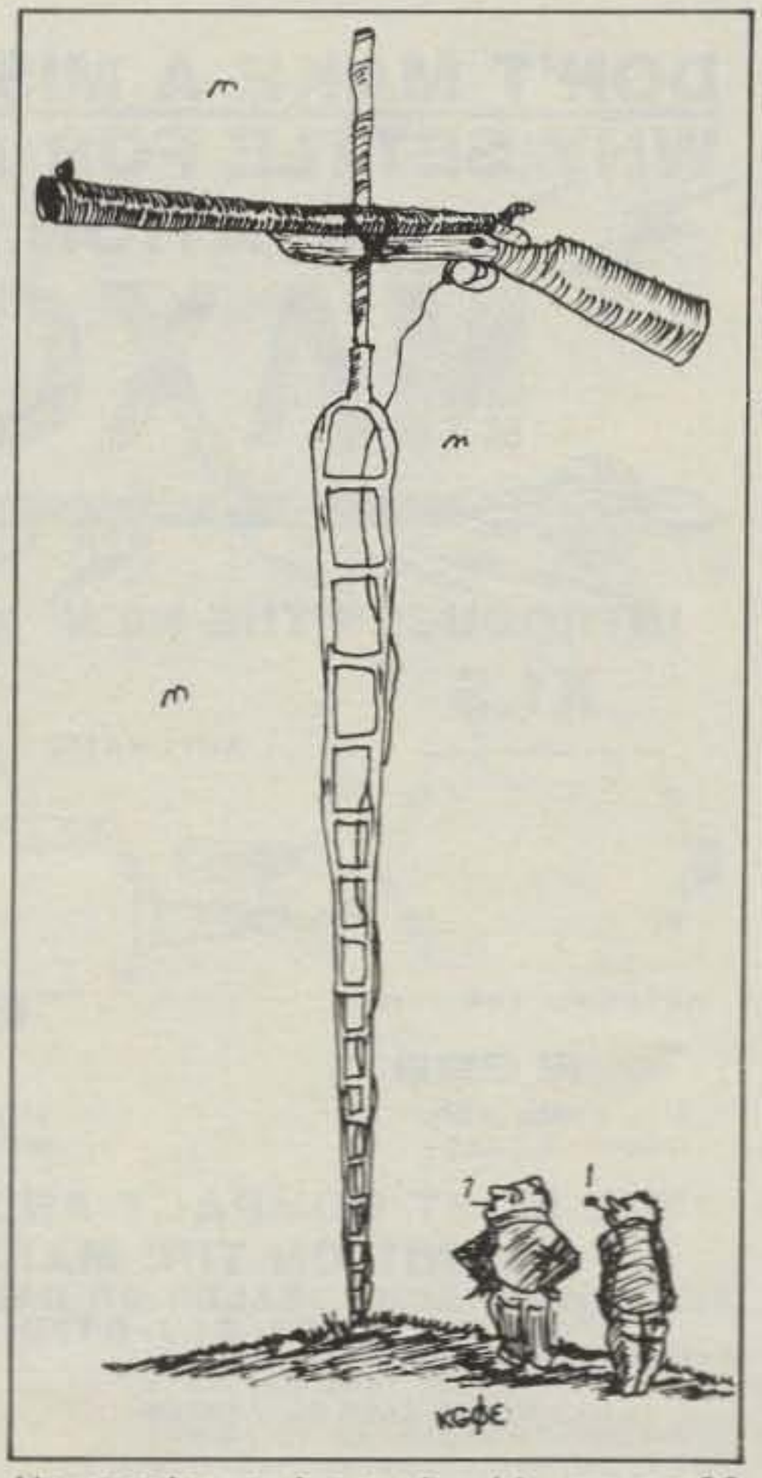


I can't wait to get this log periodic on the air!

A few days later I was out surveying the lower 40 (the lower 40 feet, that is) and figured there was really no way that my tribander—a TH3 JR.—was going to fit and be rotated without going over the property lines of my neighbors. Dare I ask them to grant this major concession? A short visit to my neighbors was all it took. As long as it was in the air above their property, they didn't mind. Chalk up another victory.

The clincher that freed me from all suspicions came about a week later. I had been working in the garage for about two hours when my neighbor's neighbor came over to tell me that little wavy lines were coming across her TV set—and I sure can't make "little wavy lines" if I'm not operating, can I? Case closed, full speed ahead.

Luckily for me, we've all learned to coexist; they can watch TV, I can DX. A few hours of involvement with my neighbors has paved my way. Instead of angry neighbors, I have good friends. Remember, love thy neighbor. CQ



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Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Military Affiliate Radio System (MARS)—Part I

I have received requests for information about the Military Affiliate Radio System (MARS). This article provides a detailed introduction to MARS. Most of this information was extracted from printed material supplied by MARS officials; however, my own comments are sprinkled throughout this article.

Our Department of Defense (DoD) sponsors the overall Military Affiliate Radio System Program. It is established and operated as three similar (but separate) programs involving Air Force MARS, Army MARS, and Navy-Marine Corps MARS.

FCC licensed amateur radio operator licenses are accepted by all three MARS organizations as proof of qualification to become MARS operators. All affiliate (civilian) MARS operators are FCC licensed amateurs. There are also full-time MARS operators who are on active duty.

History

A few dedicated pioneers in the U.S. Army Signal Corps formed the Army Amateur Radio System (AARS) during November 1925. AARS remained active until its operations were suspended 7 December 1941, at the start of World War II. More than 8000 amateurs received military communications training in AARS prior to WW II. There were approximately 60,000 American amateurs just prior to the outbreak of WW II, and about 5600 of them were AARS members. If that pre-WW II percentage existed today, Army MARS would have approximately 38,000 members. The combined MARS membership is now about 12,000. There are about 5200, 3500, and 3000 members in Army, Air Force, and Navy-Marine Corps MARS, respectively. About 20% of the pre-WW II AARS members served our country in military or civilian capacities during that conflict. AARS was reactivated in 1946 and it functioned until 26 November 1948, when the Air Force and Army established the Military Amateur Radio System (MARS). The name of this dual program was changed to the Military Affiliate Radio System 2 September 1956, with the coined name remaining MARS. On 17 August 1962 the Navy-Marine Corps MARS organization became part of the overall DoD MARS Program with a starting date of 1 January 1963. I held Army MARS call sign A1SAD in the early 1950s, and my Navy MARS call sign was NØAEJ during the early 1960s.

2814 Empire Ave., Burbank, CA 91504

Emblem of the Military Affiliate Radio System (MARS)

Objectives

The objectives of the three MARS groups are as follows:

1. Attract and train members in military communication procedures, creating a potential reserve of radio operators.

2. Handle morale and quasi-official traffic for armed forces and authorized government civilian personnel stationed throughout the world.

3. Provide military and/or civilian disaster officials with auxiliary communications during emergencies, handling local, national, and international messages. This helps effect normal communications following disasters that overload or disrupt telephone, telegraph, and other communication channels.

4. Provide DoD sponsored emergency communications as an adjunct to normal local, national, and international communications.

5. Handle standard military communications if this need arises; however, MARS does not handle such traffic under normal circumstances.

6. Conduct an appropriate amateur radio participation program as part of the Annual Armed Forces Day celebration. This includes direct contact between amateurs and military stations. It also includes a code proficiency award to each amateur who correctly copies the Secretary of Defense's message at 25 wpm. Military and amateur radio operators transmit on their own respective frequencies during Armed Forces Day cross-service contacts, and they listen (only) on each other's transmit frequencies. This activity occurs on the third Saturday in May.

Call Signs

MARS stations are identified by their assigned military call signs. One does not use her/his amateur radio call sign when operating as a MARS station and using military frequencies.

Air Force MARS callsigns, issued to ordinary affiliate members, start with the prefix AFA or AFB, resulting in a call sign such as AFA7UG. Air Force MARS officials (regional and state directors) are issued call signs starting with the prefix AFF. Air Force MARS military stations use call signs beginning with the AGA prefix, such as AGA3HQ (Scott Air Force Base in Illinois), the master net control station for USAF MARS. An exception to this AGA prefix use is the Andrews AFB station call sign, which is AIR.

Army MARS call signs start with AAA through AAZ prefixes, and AAV9CO is an example of an Army MARS call sign.

Navy-Marine Corps MARS issues call signs starting with the prefix NNNØ, and NNNØERD is an example of a Navy-Marine MARS call sign. Other military call signs may be used on MARS nets during actual emergencies and communication exercises, when such usage is authorized by a cognizant authority.

Modes

Most of the MARS nets involve single sideband (SSB) voice operation in the high frequency (3 to 30 MHz) range. However, there are also MARS nets using radiotelegraph (code), radioteletype (RTTY), and slow-scan television (SSTV). MARS is authorized to use all modes of emission that amateur radio is permitted to use. New MARS members are assigned to code and/or voice nets close to amateur bands. Experienced MARS members are allowed to operate RTTY, SSTV, and other exotic modes on MARS frequencies, most of which are further away from amateur bands.

Frequencies

MARS stations use military frequencies. Day-to-day operations are conducted on frequencies close to amateur bands. Transcontinental, international, and other more exotic (non-training) nets are run on frequencies that are farther away from amateur bands. Many MARS frequencies are within 200 kHz of amateur radio bands.

Meet Kirk F. Couch, KA7UUC, of Tucson, Arizona. He is active on the 15, 40, and 80 meter bands. Kirk has contacted amateurs in seven countries and several states. He participated in the 1985 ARRL Field Day Contest, operating with the Old Pueblo Amateur Radio Club. He credits Marty Martinson, N7GWF, and Michael Wilson, KA7UCW, with helping him get started in amateur radio.

Typical Air Force MARS frequencies in the 3 to 30 MHz range include 3292, 3299, 3308, 3314, 4487, 4517, 4580, 4590, 4593.5, 4832, 7302, 7305, 7313.5, 7324, and 7457 kHz. USAF MARS regional nets are conducted on the preceding frequencies. USAF MARS uses 143.95 MHz for its 2 meter FM simplex (reception and transmission on a common frequency) operation, whereas 142.150 and 143.450 MHz comprise its standard repeater pair on 2 meter FM.

Typical Army MARS frequencies include 3348.5, 6997.5, and 14403.5 kHz in the 3–30 MHz HF range.

Typical Navy-Marine Corps MARS frequencies include 3190.5, 4042.5, 7382.5, 13975.5, 14385, and 20998.5 kHz in the HF range.

Nets

MARS affiliate operators participate in networks of their own choosing. Administrative nets handle much of the day-to-day traffic that is required to manage the program. Training nets are used to teach required fundamentals of military communications and message handling. Technical nets provide opportunities for members to increase their knowledge of several associated electronics and communications subjects. Traffic nets handle third-party traffic, which is written (message) and voice (phone patch) traffic that involves more than the operators handling it. Emergency nets are exercised to keep MARS members ready to handle communications when real emergencies (floods, earthquakes, hurricanes, etc.) occur.

Some MARS nets operate on frequencies as much as 200 kHz above or below the edges of nearby amateur radio bands.

MARS only allows its members to operate on HF (3 to 30 MHz) net frequencies while nets are in session; these net frequencies are not used for hobby-type contacts, such as are common on the amateur radio bands.

New MARS members receive on-the-air training while participating in regional high-frequency nets. When one becomes proficient in the use of military radio procedures, long-range net activities become available. These advanced nets include transcontinental radiotelegraph (code), transcontinental radioteletype (RTTY), transcontinental SSB (voice), and international phone patch nets. AGA3HQ (Scott AFB, IL) is the master control station of the

N8FRI

Mike Horn
516 Union Place
Fremont, Ohio
USA 43420

GRID EN81 SANDUSKY COUNTY

AMATEUR RADIO	CONFIRMING 2-WAY CONTACT					
	DATE	UTC	FREQ	RST	MODE	QSL
						TNX PSE

Shown here is 32-year-old Mike Horn, N8FRI, of Fremont, Ohio. He obtained a Novice license during January 1984 and upgraded to Technician three months later. Mike is a land surveyor. His high-frequency (3–30 MHz) station includes a Kenwood TS-430-S transceiver, Heath electronic keyer, and 40 meter dipole. Mike has contacted amateurs in 36 states and 3 countries.

Air Force MARS transcontinental SSB (voice) net.

MARS operates local, state, region/area, national, and international network/circuits (nets). Most major traffic nets operate daily, whereas administrative and technical nets may meet only weekly. Some MARS nets are conducted in the VHF (30 to 300 MHz) range. It is advisable to contact state or region/area MARS officials to obtain specific details regarding local net operations, since net activities can vary from one region to another.

Navy-Marine Corps MARS runs the "Afloat Specialty Network," providing phone patch (third-party voice) service to personnel aboard U.S. military vessels in international waters.

Repeaters/VHF

MARS operates VHF FM repeaters in more than 100 large metropolitan areas, as well as in areas of lesser populations that have many MARS members. These repeaters are available for use by affiliated MARS members whenever they are not being used to conduct a formal MARS exercise, such as a net. The U.S. Air Force MARS nationwide standard repeater pair for 2 meter FM operation is 142.15 MHz (repeater input) and 143.45 MHz (repeater output). The Army MARS nationwide standard repeater pair for 2 meter FM operation is 148.01 MHz (repeater input) and 143.99 MHz (repeater output). The Navy MARS nationwide standard repeater pair for 2 meter FM operation is 148.375 MHz (repeater input) and 148.975 MHz (repeater output). The MARS nationwide 6 meter frequency is 49.98 MHz. This privilege is not extended to MARS members in regard to HF (3 to 30 MHz) MARS frequencies.

Gateway Stations

Air Force MARS operates 270 stations throughout the world. The Air Force MARS gateway stations are as shown in Table I. Stateside Army MARS gateway stations are located in California (Presidio of San Francisco), Hawaii, Maryland (Fort Meade), and Texas (Fort Sam Houston). Overseas Army MARS stations operate from West Germany and South Korea.

Messages

MARS operators just handle personal messages to and from Armed Forces and other U.S. Government personnel (plus their dependents) serving overseas. MARS message traffic cannot be addressed to personnel aboad ships. Such messages must be addressed to an authorized APO or FPO. The three MARS organizations cooperate with each other in regard to handling traffic; messages are routed via the network that provides the best service, regardless of which MARS group originated such messages.

Personal (third-party) message traffic can be refiled between amateur (National Traffic System) and MARS. This is done when it is impractical to handle a particular piece of traffic solely via MARS networks. MARS originated traffic must be converted to the amateur radio format before it can be refiled into an amateur net. Similarly, amateur-originated traffic must be converted to the MARS format before it can be refiled into a MARS net. The third-party restrictions that apply to amateur radio also apply to MARS. MARS has additional restrictions regarding messages about death or serious illness in one's immediate family; such traffic cannot be handled via MARS networks. MARS official administrative traffic cannot be refiled into our amateur radio service. Third-party traffic cannot be originated by, or delivered to, personnel serving in areas or in countries which do not allow MARS operation.

If a piece of MARS overseas-originated (only) traffic cannot be delivered through MARS or amateur nets, the Department of Defense (DoD) pays the postage that is required to deliver it. Mail delivery of traffic is avoided as much as possible. CONUS-TO-CONUS traffic cannot be mailed.

This completes the first half of this two-part article about MARS, which will be concluded in next month's Novice column. Benefits, eligibility, joining, U.S. Air Force MARS, Army MARS, Navy-Marine Corps MARS, participation, resigning, and the summary will be covered in the next issue.

Call Sign	Location	Area Served
AGA2LA	Langley AFB, VA	Central and South Americas
AGA5MC	McChord AFB, WA	Alaska
AGA6TR	Travis AFB, CA	Pacific
AGA7ZW	Zweilbrucken AB, W. Germany	Europe-CONUS
AGA8HI	Hickam AFB, HI	Pacific-radioteletype
AIR	Andrews AFB, DC	Europe

Table I– Air Force MARS gateway stations.

No -69-70

Antennas & Accessories

a monthly feature by
KARL T. THURBER, JR., W8FX

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

A Peek at Packet

There's a good deal of racket about packet, both on the air and in the pages of your favorite amateur radio magazines. Our columnist takes a nontechnical look at this interesting but difficult to understand new communications mode. —K2EEK

Last month in your column we took a look at several aspects of practical communication range determination on VHF and UHF. We examined line-of-sight factors, the radio and optical horizons, station gain, path loss, and other factors that go into bottom-line communication range. We also headed for the bookshelf for some notes on several new and interesting amateur radio and computer publications, including fellow *CQ* columnist Ade Weiss, K8EEG/W0RSP's new QRP book. Rounding out tne column, we discussed several new software products.

This month we'll survey, from a nontechnical standpoint, one of the newest communications modes available to amateurs, that of packet radio. We'll approach the subject with the view to filtering out much of the "QRM racket" that surrounds information on this increasingly popular but somewhat mysterious and forbidding operating mode. That will use up most of the space in this month's column, but we'll save room to note some interesting and instructive reading material and to bring to light some useful hamshack software.

Packet: A Quick-and-Dirty Peek

Packet radio is currently "hot," and it's going through a period of tremendous growth. From all indications, it's the biggest thing to hit amateur radio since the FM repeater craze of the mid-1970s. There's a good chance that you've read or heard of packet radio, but are unsure of exactly what this mode is and what packet operation entails. In the limited space we have available, we'll look at just what packet radio is and how it works, what its advantages are, what equipment and software is needed for operation, and how it can be useful to amateurs. We'll also survey some of the standards and protocols involved.

What It Is. Packet radio, or simply "packet," is the common name for a high-speed, digital, error-free, electronically "handshaking" method of communications, similar in many respects to RTTY and AMTOR. Packet is a method of communicating with similarly equipped stations, or a group of stations, using a combination of keyboard and video screen, instead of mike and key. Packet is designed to allow automatic linking of systems for cross-country networks. While similar to RTTY and AMTOR, it's different in that communications data is sent at a much higher speed than with these two modes, and in a sort of "connected" or telephone link-like, virtually QRM-free mode.

What the packet technique does is to break down the data sent to it into small pieces called "packets." The packets are short (up to 128 characters), coded transmissions that convey the information. Each packet contains a header that tells who the packet is for and from whom it came. The packet also contains "routing" information, the message data proper, and an error ("frame checking") detection routine. The packets are sent at high speeds, when compared with CW, RTTY, and AMTOR. On HF packet data transmission is limited by the FCC to 300 bits-per-second (BPS), as this is written. But on VHF and UHF, 1200-bit rates and higher are common. However, even these lofty data rates don't press against the upper limit, as experimental transmissions have been made at rates as high as 250,000 BPS, and possibly even higher.

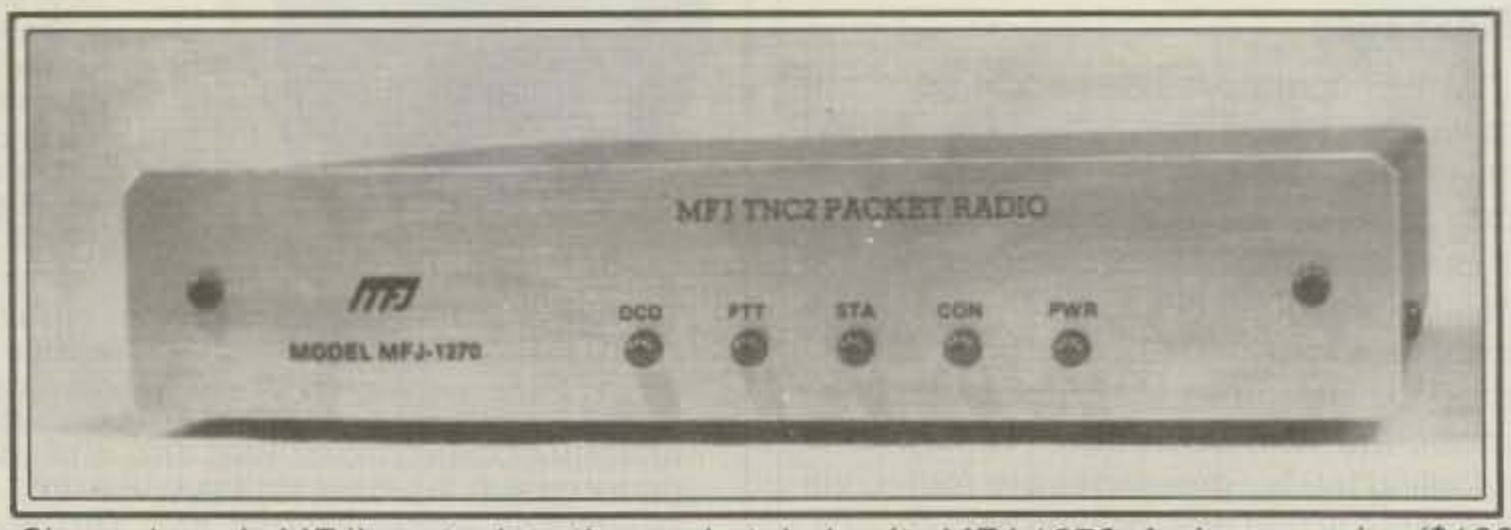
Inasmuch as packet breaks up a datastream into short sections known as frames, packet appears to the operator like full duplex communications. This means that both parties can "speak" at the same time, similar to the ordinary telephone landline or break-in (QSK) CW, with all the advantages that full break-in operation offers.

Of course, to make packet work all stations must use the same, or a compatible, protocol—an electronically defined way of doing things. There are two main packet protocols in use today. The older one is the so-called Vancouver (VADCG) Protocol, written in 1982. The protocol is the grandfather of amateur radio packet protocols, but it has gradually died out and has largely been replaced by the newer AX.25 Protocol.

The AX.25 Protocol was announced at the March 1983 Second Annual ARRL Computer Networking Conference. While AX.25 has a lot of overhead (dead space) in the packet frame, and thus was initially criticized for inefficiency, the new protocol offers several improvements over the Vancouver Protocol. Presently, only a few areas in the U.S. and Canada make regular use of the older protocol. As these protocols are necessarily international in scope, the IARU (International Amateur Radio Union) has designated the ARRL as the international clearinghouse of packet information, with a view toward encouraging international standards and regulations.

The Essential Difference. The main difference between packet radio and RTTY and AMTOR lies in the improvement that packet offers in terms of communications reliability. Information that is sent by packet is checked to see that it was received exactly as transmitted. Data is automatically retransmitted until it is accurately received so that there is little chance that "bad data" will get through. Naturally, real-world reception is not absolutely guaranteed, since a fairly clear frequency is still needed for the stable, low-noise environment that packet likes.

Packet is most suitable for VHF and UHF work. While communication range is necessarily limited without networking, its superiority over AMTOR and RTTY can make it shine. Nevertheless, more experimentation on HF is needed to refine techniques before packet can emerge as



Shown here is MFJ's entry into the packet derby, its MFJ-1270. An inexpensive ($130 price class) TNC, the device is a nearly identical clone of the popular TAPR TNC 2 with identical hardware and software. The unit may be used with any computer that has an RS-232 serial port. (Photo courtesy MFJ Enterprises, Inc.)

317 Poplar Drive, Millbrook, AL 36054

a clearcut winner over the older and more familiar modes.

What's Needed for Packet. To get into packet three things are needed. First, you need a transceiver for the band and mode on which operation is desired. To date, most work has been on 2 meter FM, but any VHF, UHF, or HF band may be used. Most HF work uses lower sideband (LSB).

Second, you need an ASCII terminal. This need not be a special, "smart" device, but rather can be the kind of "dumb terminal" that many surplus computer dealers sell quite inexpensively. The terminal provides the necessary video display. If you want the capability to print out packet communications, you would naturally need a printer, and to store and recall files, a disk drive or other storage medium is required.

Third, you need a controlling computer, forbiddingly named the "terminal node controller," or TNC, the heart of the packet system. The TNC's main job is to convert the data into packets, and packets into data. The TNC obtains its data from the user, forms it into packets, and sends out the packets. Going the other direction, the TNC listens for incoming packets, converts them into data, and passes the data on to the user. The TNC executes the packet protocols or standards, and it controls the various functions required for connecting up with another station, identifying your station, functioning as a repeater (or "digipeater"), and performing various housekeeping chores.

The TNC is, essentially, a dedicated packet microcomputer, the program being stored in read only memory (ROM), with random access memory (RAM) being used to store specially processed data for transmission and reception. A dedicated, integrated TNC with video display screen provides topnotch results, but may cost upwards of $1,000, not counting printer, disk drive, and other accessories. To keep costs down, it's possible for one to use a computer he or she already owns, such as a Commodore 64, IBM-PC, Apple, Macintosh, etc. A computer can be used by installing an asynchronous RS-232 card or port on the computer (if not already so equipped), purchasing a terminal emulator software program for their computer, and obtaining a TNC package (such as AEA's Packet Controller, Kantronics' Packet Communicator, or Heath's HD-4040 TNC).

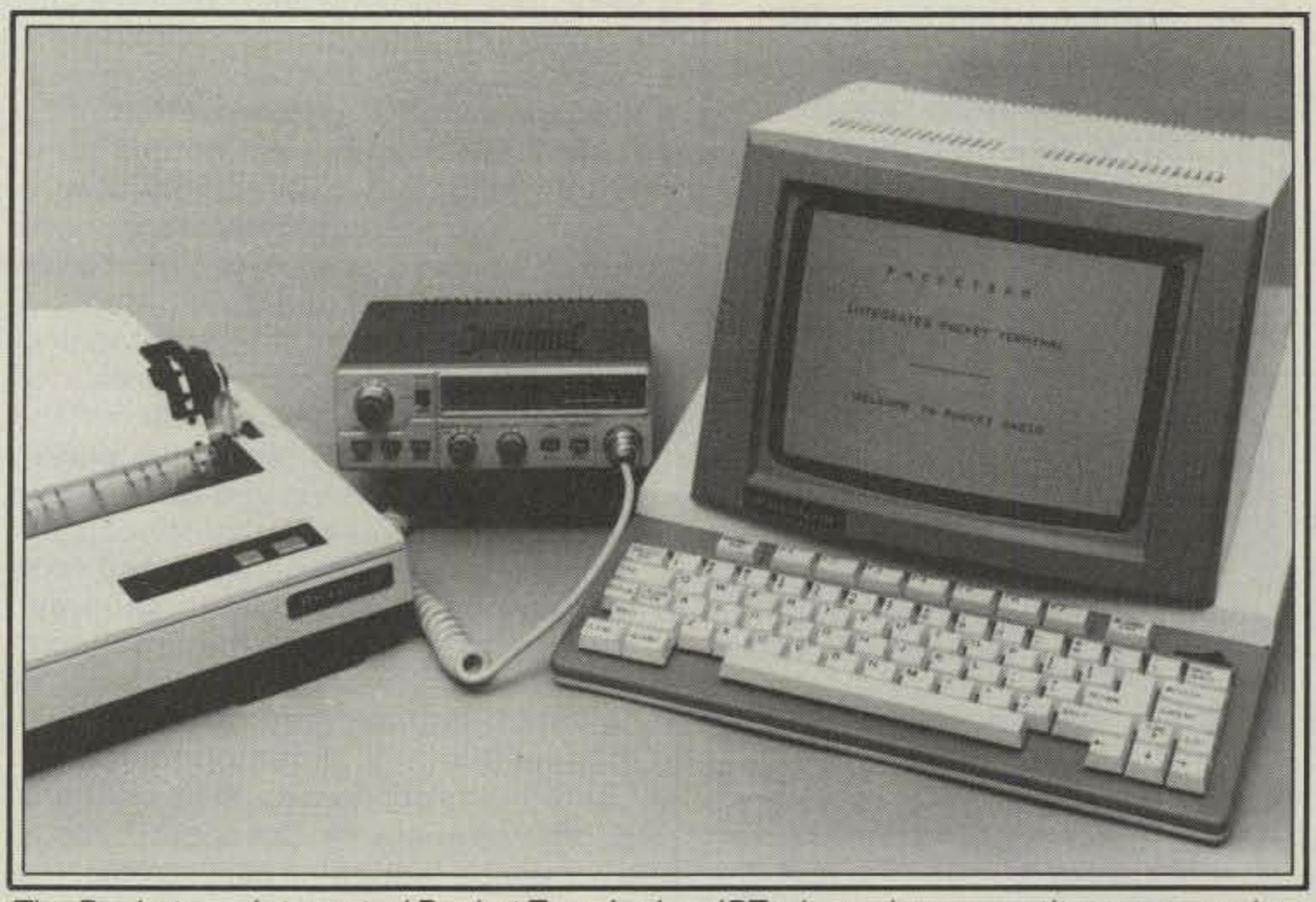
This approach is becoming increasingly popular, and new software/firmware combinations are on the way that may enable the computer itself to act as its own TNC, thus eliminating the need for a separate TNC "black box." However, writing the TNC software is one of the more difficult programming tasks in amateur radio computing. Nevertheless, one firm, Richcraft Engineering LTD., has already done this, having written complete packet system software for the Radio Shack Model I, III, and IV computers. This approach, available for both the Vancouver and AX.25 Protocols, eliminates most of the "extra stuff" contained in the separate TNC.

Older, workhorse microcomputers such as the Radio Shack Model I may find a home as packet computers or terminal node controllers (TNCs). (Photo courtesy Radio Shack)

At least one firm has developed software to enable the Radio Shack Model I (shown here), III, and IV microcomputers to function as terminal node controllers (TNCs) for packet reception and transmission. (Photo courtesy Radio Shack)

Also, some amateurs have successfully harnessed the new-breed, graphically interfaced computers, such as the Apple Macintosh, to packet. These computers can eliminate much of the complexity of packet operation by replacing long text command strings with mouse-controlled graphics displays. Jack Brindle, WA4FIB, of Brincomm Technology, 19451 Gulf Blvd. #503, Indian Rocks Beach, FL 33535 has done this. He offers an inexpensive TAPR TNC "front end processor" for the Apple Macintosh, known as MACPACKET/TAPRTERM. Hopefully, another programming wizard will develop a similar product for the Commodore Amiga and the Atari 520-ST "magic" computers!

Packet Applications. Packet radio is very



The Packeterm Integrated Packet Terminal, or IPT, shown here constitutes a complete terminal and packet node controller in one package; one need only connect the IPT to the transceiver to be on the air with packet. Other approaches to packet transmission and reception are discussed in this article. (Photo courtesy Packeterm®)

broad in its uses. It has a real place in ragchewing, network operations, traffic handling, satellite communications, repeater work, and the like. Since the packets are of very short duration, it's possible for several stations to simultaneously and successfully share the same operating frequency; others on the same channel are not interfered with.

There's also a "store and forward" capability which enables individual packet stations to operate as repeaters, or digipeaters, for extensive networking. An important point to make is that a station acting as a digipeater requires no duplexers, due to packet's simplex nature. Packet systems are particularly well suited as on-the-air bulletin boards, which, like more common RTTY boards, provide amateurs with a sort of information clearinghouse service, with public and private storage and forwarding of messages and bulletins.

Use of packet with amateur satellites has already been achieved, but this method of operation should be greatly enhanced by the planned launch of a fully dedicated Packet Satellite (PACSAT) in early 1987. Currently under construction by AMSAT and VITA (Volunteers in Technical Assistance), the bird will reportedly have a four megabyte memory. A ground station can send a message intended for another station to the satellite; PACSAT will store the message in its memory until the other station checks in and retrieves his messages. Thus, it functions as a sort of "flying mailbox."

HF packet has taken a back seat to VHF work to date. Still, experimental HF packet communications, especially on 10 and 28 MHz, has proved its viability, though the need to develop better HF operating techniques is apparent. AMRAD, the Amateur Radio Research and Development Corp., has plans for a "packet adaptive modem" that can change speeds, over the range 75-1200 BPS, to deal with the QRM and QRN experienced on HF.

The Future. Packet already does some "neat" things, as we've seen. But being a digital, smart, and fairly inexpensive mode of communications, we've only been given a hint of what could come.

On the horizon is an enhanced protocol that will allow much more sophisticated networking among stations, one with the ability to intelligently repeat the packet frame along a route between the sending and destination stations, regardless of the distance involved. Such advanced communications may make use of "gateway" stations that computer-link two communications networks. While packet gateway stations already are in use, eventually users of local VHF networks might use gateways to connect to an international packet radio network. This capability could even enable worldwide data communications from that little VHF hand-held talkie currently hanging from your belt!

More sophisticated, computer-controlled bulletin board and remotely operated computer services are on the horizon, too, and some of these may incorporate features of digitized voice and video to add some real flair to two-way communications.

Packet can have a big future role to play in terms of public service and traffic handling. Packet is ideal for providing hardcopy, large volume networked data communications, over any distance, with portable or even hand-held transceivers. There's a real need to develop techniques for participation in search and rescue operations, natural disasters, athletic events, races, and the like.

In this short orientation we've only briefly touched on what packet is and what can be done with it. For more information on packet, dig into the increasing number of operating and technical articles and columns featuring packet that appear regularly in *CQ* and the other amateur radio magazines. Check out what's going on with the TAPR and Vancouver Protocols; read up on new packet interfaces, software, and terminals offered by amateur radio equipment suppliers; stay current with a subscription to one of the several packet newsletters; and look for new packet-oriented handbooks at your dealer's and in the *CQ* Book Shop.

The main thing, of course, is to realize that while packet is still on the ground floor, it seems to be on an elevator ride to the top in amateur radio—certainly no "flash in the pan." Eventually you'll want to stop reading about packet and do something about it, pushing that "up button" for an interesting ride to the top.

Good Reading

Since our focus this month is on packet, we'll concentrate on sources of packet and computer information which you should find useful. We've mentioned a few of these sources previously in the column, but they bear repeating.

AMRAD Newsletter. This newsletter is published by the Amateur Radio Research and Development Corporation, P.O. Drawer 6148, McLean, VA 22106-6148. AMRAD is a worldwide, tax-exempt scientific and educational organization of over 500 amateur radio and computer experimenters. One of AMRAD's goals is to collect and disseminate technical information, and it does this through its newsletter. Recent issues of the "AMRAD Newsletter" have been heavy with packet topics. Though technically oriented, the newsletter articles are nevertheless quite readable by the beginner in packet and other new-technology areas.

The newsletter is sent to members monthly, and it can also be mailed to clubs on an exchange basis. Basic membership is $15 per year. For more information, contact AMRAD at the above address.

Gateway. This is the ARRL's packet newsletter, intended to be a "news source" rather than a technical publica-

tion. The concept is for the editor to bring together notes and development efforts from the various sources of packet information which flow into ARRL headquarters. These sources include overseas and domestic packet club newsletters, the FCC and IARU technical conference minutes, bulletin board SYSOPs, and the like. A 25-issue domestic subscription to the newsletter is available for $6 to ARRL members, or $9 to nonmembers. Subs are available from the ARRL, 225 Main Street, Newington, CT 06111.

Richcraft Engineering Publications. Robert M. Richardson, W4UCH, has published a definitive two-volume packet book, *Synchronous Packet Radio Using the Software Approach.* Volume 1 covers the Vancouver Protocol, while Volume 2 covers the AX.25 Protocol. Each volume is available for $22, while separate program disks for the TRS-80 Models I, III, and IV microcomputers are available for $29 each.

W4UCH takes a ground-breaking new approach to packet radio, using software to replace the hardware found in the Tucson and Vancouver TNCs. By eliminating much of the Specific TNC hardware, and using a "host" personal computer to perform necessary functions, packet installation is simplified and cost is reduced. The book represents an encyclopedia of packet information for both the newcomer and oldtimer alike. It should be of considerable interest to those who wish to thoroughly understand the protocols, regardless of whether they will take the software or hardware approach in their hamshack.

For additional information, contact Richcraft Engineering Ltd., #1 Wahmeda Industrial Park, Chautauqua, NY 14722.

Packet Status Register. This is the official publication of the Tucson Amateur Packet Radio Corporation (TAPR), one of the groups that got the packet ball rolling in the early days. TAPR is a nonprofit scientific and development corporation which exists for the purpose of designing and developing new systems for amateur radio packet communications, and freely disseminating the results of such research to the amateur community. Both hardware and software support is provided to packet enthusiasts.

The PSR newsletter is published for TAPR by the Minnesota Amateur Packet Radio group (MAPR). For information, contact MAPR, c/o Pat Snyder, WAØTTW, University of Minnesota Computer Center, 208 Union Street SE, 227 Experimental Engr. Bldg., Minneapolis, MN 55455. For TAPR membership information, Contact TAPR at P.O. Box 22888, Tucson, AZ 85734. Dues are $12 per year.

FADCA > BEACON. This rather large newsletter is the journal of the Florida Amateur Digital Communications Association (FADCA), but it contains material useful to packeteers far and wide. The newsletter features packet news and information, test reports, digipeater and BBS news, and several regular columns. It is published on a monthly basis. FADCA membership information and newsletter details can be had by writing to FADCA, c/o Gwyn Reedy, W1BEL, 812 Childers Loop, Brandon, FL 33511.

An Introduction to Packet Radio. A very informative and well-written six-page introductory paper on packet was prepared by Geof Potter, K1LLR, for Packeterm, a major supplier of integrated packet terminals. This concisely written paper nicely describes what packet is; shows its advantages over RTTY, AMTOR, and other modes; explains the makeup of the packets themselves; illustrates the applications to which packet is being put; tells what kinds of equipment are needed for packet operation; and provides a bibliography of useful packet references. Packeterm normally includes a free copy of the article in any mailing; ask for it when writing. Contact Packeterm, P.O. Box 835, Amherst, NH 03031.

AEA Videotape. Not strictly "reading matter," but nevertheless this is a good place to note that AEA has available VHS and Beta formats of a videotaped packet presentation to a radio club by Pete Eaton, WB9FLW. The speaker goes through the basics of packet radio with overhead slides and hardware, and entertains questions from the club afterwards. The tape takes a little over an hour to show. AEA will copy the tape onto your tape, if you send it to them, for $3.50 to cover postage and handling costs. For information, contact John Gates, AEA, Inc., 2006-196th SW, Lynnwood, WA 98036-0918.

Computer Trader Magazine. *CTM*, already heavily involved in promoting computers in the hamshack, has steadily increased its packet coverage in the past year. Chet Lambert, W4WDR's magazine generally has a couple of packet columns and articles in each issue. Domestic subs are $15 per year, and can be had by writing to CTM at 1704 Sam Drive, Birmingham, AL 35235.

PC Solutions. This is a combination catalog and newsletter for the MS/PC-DOS market, published by Computer Solutions, P.O. Box 354, Mason, MI 48854. Although I am not blessed by ownership of an MS/PC-DOS compatible computer, I found the newsletter chock full of interesting information. This included details of newly released software, reviews of inexpensive but high-performing hardware and software packages, and listings of several simple but useful programs—although there was nothing specifically for amateur radio.

The firm also functions as a discount buying service, and offers a large PC/MS DOS library to customers at very low prices. For example, the firm offers an $8 disk which contains a complete list of all public-domain programs offered in the several hundred disks stocked, along with brief description of each program. A "disk of the month club" is also featured.

The "PC Solutions" newsletter is

available for $12 for 12 issues. Write c/o Computer Solutions at the address listed above.

Software of Note

Lawler Microsystems. Have the urge to be your own "SYSOP"? From Brian H. Lawler, KN0N, comes word of his RBBS/64 radio bulletin board software package for use with the Commodore 64. In RBBS/64 fully automated message storage and retrieval are provided for user-selectable 60–132 wpm Baudot and 110–1200 Baud ASCII RTTY. Up to 100 messages may be stored, and program upload/download is supported. Some of the program features include user file storage, a SYSOP break-in mode, as well as editor and system configuration programs.

The package includes a disk containing the software programs, a C-64 user port I/O connector, and instructions. In addition to the computer and transceiver, the system requires a disk drive and an RTTY terminal unit. A printer is optional. RBBS/64 is billed as a "no experience necessary" product, one which is menu-driven and which does not require any computer programming knowledge by the user.

According to Brian, he has in the works a Commodore 128 BBS (essentially an updated RBBS/64 with 80-column display and larger file capability), and a Spanish-language version of RBBS/64. Both of these systems should be available by the time this column appears. He also advises that some hams are using RBBS/64 on packet due to its 1200 Baud capability, but he wants to design a specific program optimized for the "near duplex" ability of high-speed simplex burst transmission.

Other Lawler products include Speedlog, a high-speed logging program for the Commodore 64 and MS-DOS computers, and Data*Max, a fast-access home filing program for the C-64. RBBS/64 is $59.95 at this writing, and is available from Lawler Microsystems, 832 S. Jessica Avenue, Sioux Falls, SD 57103.

MINIPROP. Sheldon C. Shallon, W6EL, 11058 Queensland St., Los Angeles, CA 90034, advises us that he has completed work on MINIPROP™, a comprehensive propagation prediction program designed to run on CP/M-80 systems having at least 37K free memory.

Shel provided us with some interesting information and background on propagation prediction programs. It's instructive to paraphrase Shel's information:

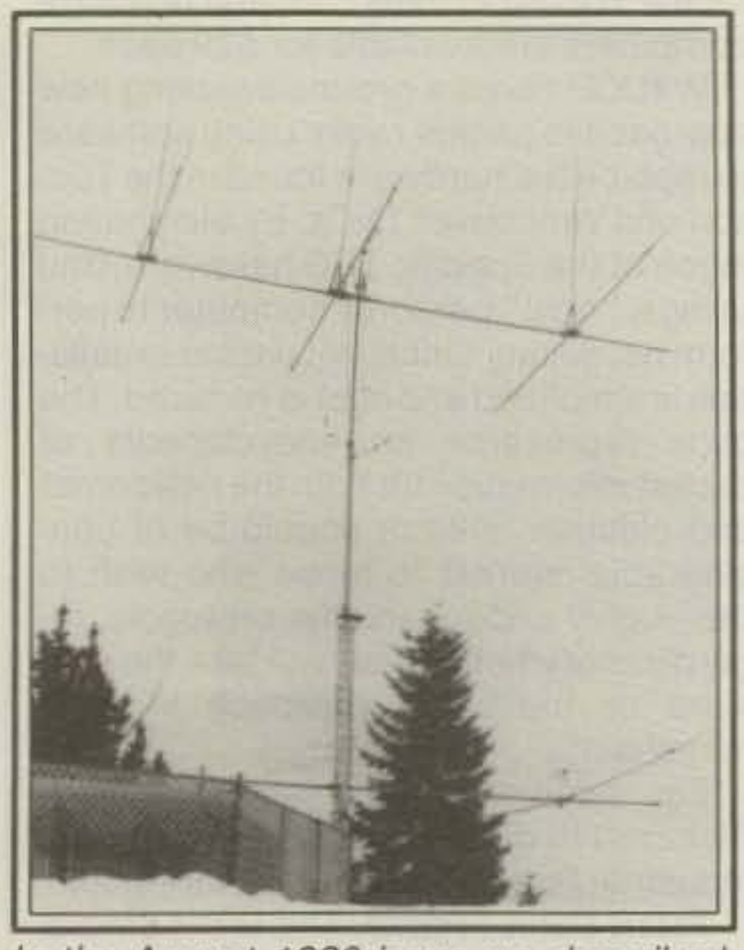
Shel wrote his first propagation prediction program in 1966 to help him work DX. The first program was a computerized version of the "cookbook" procedure contained in NBS Circular 462 and was written in BASIC on a GE timesharing computer. Over the next few years he revised the program several times to take advantage of improved prediction algorithms contained in various NBS and ESSA publications, and personal correspondence with other propagation researchers. Additional program versions were written in BASIC, FORTRAN, and other languages for various computers. Shel points out that all of these programs predicted only signal strength. MUF was predicted graphically, using special techniques.

In December 1982 the landmark MINIMUF-3.5 program, developed by the U.S. Naval Ocean Systems Center (NOSC), appeared in *QST*. This was in Bob Rose, K6GKU's article "MINIMUF: A Simplified MUF-Predicting Program for Microcomputers." Shel points out that although MINIMUF used an incorrect algorithm for some control points that are in midnight sun and polar night conditions, MINIMUF made practical the prediction of *F*-layer MUF on personal and home computers. Having an accuracy of within 3.8 MHz, MINIMUF is actually slightly more accurate than several large-scale computer programs against which it was compared in various studies.

Shel's MINIPROP combined the prediction of signal levels, *F*-layer MUF (using improvements on the original MINIMUF-3.5 for midnight sun and polar night conditions), and *E*-layer cutoff frequency. Shel asserts that, to his knowledge, MINIPROP is the most comprehensive propagation prediction program available for microcomputers.

MINIPROP is a "user supported" program. This means that if you obtain the program, which is copyrighted by the author, you should consider sending a contribution in the suggested amount, in this case $25. Shel is not in the software distribution business, however, and prefers that people not send him a remittance for a diskette. He asks that people who want a copy should inquire among their friends and on amateur-oriented bulletin-board systems for the program. Shel advises that two BBSs that he knows have the program available for download are the Napa Valley RCPM, phone number 707-257-6502, and the G.F.R.N. Data Exchange, at 213-541-2503.

In a brief followup note from Shel, he advises that MINIPROP is now available in a version that runs on computers using the PC/MS-DOS operating system, and may be found on amateur-radio-oriented bulletin boards.



In the August 1983 issue we described Jack Riggs, N7AM's 5-element 80 meter vertical and 3-element 40 meter Quad that have served to put Bremerton, Washington on the DX map. Jack has reworked his antenna farm to now include three quads: a 3-element 20 meter; a 3-element 40 meter; and a 2-element 80 meter quad on a rotary tower. It's an impressive DX tower. It's an impressive DX setup, and in a forthcoming column we'll take a look at it. (Photo courtesy N7AM)

Wrapping It Up

We have undoubtedly overshot our space allocation this month, so we'll have to tie up any loose ends next time. To recapitulate, we peeked into packet this month, looking at what it is, how it works, what it does, and what the future holds. We also took note of some packet- and computer-oriented newsletters and other publications, and highlighted some new hamshack software.

Next month we'll continue with more antennas and accessories subjects of timely interest. See you then.

73, Karl, W8FX

DAYTON **Hamvention®** **April 25, 26, 27, 1986**

- **Technical Forums** — Personal Computer, Packet Radio, ARRL, AMSAT, Antennas, RTTY, SSTV/ATV FCC, Electrical Safety and many, many others.

- **New Products** — See, touch and feel the latest in high-tech equipment.

- **Giant Flea Market** — Starting at noon Friday, all day Saturday and Sunday. All spaces are **SOLD OUT.**

- **License Exams** — Novice through Extra, by reservation only. Send a completed form 610, a copy o your present license and a check or money order for $4.25 payable to ARRL/VEC Indicate the desired time. Send to: License Exam, Attn. Tom Holmes, 8830 Windbluf Pt., Dayton, OH 45459. **Deadline: March 29.**

- **Alternate Activities** — HAMVENTION is for everyone. We have planned activities for the YL or you non-ham family members.

- **Special Awards** — Nominations are requested for "Radio Amateur of the Year," "Special Achievement" and "Technical Achievement" Awards. Contact: Awards Chairman, Box 44, Dayton OH 45401. **Deadline: April 1.**

- **CW Awards** — See how fast you can copy the International Morse Code (World record is 72.5 WPM). All participants receive an award indicating their maximum speed.

- **Admission** — Registration: $8.00 in advance, $10.00 at the door.
Banquet (Roy Neal, K6DUE, Speaker): $14 in advance, $16.00 at the door, **if available.**
Ladies Luncheon: $6.75.
Last Day for advance tickets: April 5 (Canada), April 12 (U.S.).

- **Housing** — Most motel rooms in the Dayton area have been set aside for the HAMVENTION Write: Dayton HAMVENTION Housing, 1980 Kettering Tower, Dayton, OH 45423 1980. **NO RESERVATIONS WILL BE ACCEPTED BY TELEPHONE.**

- **Parking** — Free parking is available at Hara Arena. In addition, there will be free shuttle bus service from all major motels and designated parking lots. Parking and road infor mation is available on DARA's 146.34/.94 repeater.

- **Other Information** — Special air fares are available on Piedmont and USAir. A free slide show abou the HAMVENTION is available for club meetings. Wheelchairs and handicap park ing are available. For more information . . . Write: Box 44, Dayton, OH 45401 o call (513) 433-7720.

This is the year for you to attend the internationally famous Dayton HAMVENTION. Come with your friends to hear enlighten ing forums, see the latest equipment, and visit a flea market that has everything! No matter what you are looking for, you can find it in Dayton!

HAMVENTION is sponsored by The Dayton Amateur Radio Association, Inc

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

It is the mystery and the dark way
That make DXers weep so sore,
They ask if sunspots will return some day
Or possibly, come no more.

Many are the Eternal Enigmas that plague DXers, and among these are the always unanswered questions as to why big-total DXers are often the old DXers, why some make unflagging attacks on DX lists and nets, and always the question as to when the sunspots and 10 meters will return.

These are some of the enigmas, and it was only a week back on a warm spring morning as we were wondering why it seems so many DXers are qualified for the Quarter Century DXers Assn., when the local list-killer came storming up around the curve of the hill. It was his first visit of the year, and we thought we knew why he had come. We were mistaken.

He got right to the point. "What's getting into the Old Timer?" he demanded. "I've been hearing that he said a DXer must worry about being bumped from the Honor Roll by a deletion. Seems to me that he ought to know that you don't get bumped by a deletion. It's not working the new countries. Isn't that right?"

Here we were, prepared to argue about lists—the good, the bad, the obnoxious, and the unnecessary lists—and this one was steaming over something else. "Well," we said cautiously, "if you check back far enough you might find instances where DXers have been bumped by deletions. But maybe it was that the Old Timer was noting what DXers worry about in the long dark hours of the night." The Local was quiet and we had to continue.

"Let's look at it this way," we said. "Do you worry more about losing the job you now have or do you worry about the one you'll have to get should that happen? Are you more concerned about a deletion erasing your cushion on the Honor Roll, or being there to make sure you catch every new one? Which keeps you awake during the long dark hours just before dawn?" We thought that this might slow the Local a bit, but he hardly showed any signs at all. We had to press on.

"Look at it from another angle," we struggled onward. "In personnel or labor relations what is the attitude often encountered? Isn't the theme usually to keep what you have and try for more? If you are staying put, you don't want to lose anything, but if you are planning a change of scene, then things might be a bit reversed. But in either instance you worry. Maybe some even enjoy it. And DXers clinging to the bottom of the Honor Roll will learn to worry early. If they miss a new country, they will be off the exalted plateau. They worry." The Local was still silent, still listening.

"There is nothing wrong with your mathematics," we told the Local. "Not working a new country will ease you off the bottom of the Honor Roll. But usually the worry is directed towards not losing what you have already. And, should you be worried about missing a new country when it shows, think of what will happen should Peter I Island come on the air. Just look at some of the announced plans for such operations and then think of the havoc that might hit the lower edge of the Honor Roll should some of them be pulled off." If this one wanted to study the perils of the Honor Roll, we would help him get a close acquaintance with worry. Maybe we would not have to haul him farther up the hill to hear the Old Timer. But right then all we were getting was an anticipatory smile on the Local's face.

"Peter I Island," he echoed. "I'm looking forward to that one. It's been a long time since I heard a new country come on the air, and it will be good to jump in again. Heck! I can't even remember which was that last new country I worked when it showed, only that I beat all the other club members to be the first to work it. I intend to do that again. Always the 'firstest with the loudest.' That's what the other club members say about me when something new shows."

We wondered if he might mention that he was not only the 'firstest with the loudest' but also with the 'longest' calls. But we were still thinking that the Old Timer was right with the premise that DXers do worry in the long hours of the night, so we decided to slip something onto the Local. We thought he might need it.

"How do you figure to work Peter I Island?" we asked, and the shining joy of a successful DXer was instantly visible on his face. Obviously this one enjoyed savoring the anticipation. "It should be easy," he calmly advised us, "even with the sunspots down. First of all, even with the cycle down, the path is good from almost anywhere in the states. Peter I is located at 90° west, just about straight south of Chicago. All I have to do is aim the beam south and fire. I'm not worried about that one, only about when it might show."

We had to think things over a bit. The veneer of assurance on a Big Gun DXer is sometimes difficult to penetrate. "But what about some of the efforts we have heard about?" we asked. "Shouldn't they make any difference?" The Local shook his head.

"Hardly at all," he promised us, "I've worked them all: Marty, the Colvins, Gus, Dale, Danny, Sanford, Ted, Bob, Franz, Jim, Baldur, Bill, Al, Larry, Carl . . . . When they showed, I worked them. Every time! Try me. Ask any question you want to about them. Go ahead!"

Not yet, we were telling ourselves. There were other questions. "How about that recent announcement wherein a solitary operator would try a solo landing on the island, operate for a couple of hours, toss all the gear into the ocean, and head back to the fishing vessel? What do you think of that?" Apparently he had not.

After a pause he asked, "Well, what about it? I've worked 'em all. What's different about this one?"

First we talked a bit about Peter I Island—how it was so far south, just over

Superman leaping tall buildings? No! It's the Super DX Duo, Lloyd and Iris Colvin, putting up the antenna atop a hotel in Namibia, Southwest Africa. They signed ZS3/W6OL at this stop. Other stops were at 3D6/7P with A2/S8/7Q/9J, and CR8 possible. By this time the Colvins are headed for Visalia for the DX Convention. They worked 10K from ZS3, 5K from 7P . . . we do not believe that any team ever worked as many DX QSOs from as many countries as have the Colvins. Certainly they are unequaled in DXing . . . now or in the past.

77 Coleman Dr., San Rafael, CA 94901

The WPX Program

Mixed

1192	K8UNP	1195	VE6VW
1193	OE3RE	1196	W9IAL
1194	W5EW	1197	DL9JI

S.S.B.

1779	I4UFH	1780	OE5BGL

CW

2343	W9IAL	2346	OH1MQ
2344	JA2IIT	2347	NK2W
2345	YU2LCF		

Endorsements

Mixed: 450 K8UNP, OE3RE, VE6VW, W9IAL, DL9JI. 500 K8UNP, OE3RE, VE6VW, DL9JI. 550 K8UNP, OE3RE, VE6VW, DL9JI. 550 K8UNP, OE3RE, VE6VW, VE7EIK, DL9JI. 600 JA4BAP, OE3RE, VE6VW, DL9JI. 650 OE3RE, VE6VW, DL9JI. 700 OE3RE, VE6VW, DL9JI. 750 OE3RE, VE6VW, DL9JI. 800 OE3RE, DL9JI. 850 NE6I, OE3RE. 900 OE3RE. 950 OE3RE. 1000 OE3RE. 1050 OE3RE. 1100 OE3RE, YU2QS, KC8CC. 1150 OE3RE. 1200 DL1AM. 1300 LA7JO. 1350 KL7AF. 1450 I2DMK. 1800 K5UR. 1850 K5UR. 1900 K5UR, N2AC.

S.S.B.: 350 I4UFH, OE5BGL, XE1AE. 400 9J2JI, I4UFH, OE5BGL, XE1AE. 450 I4UFH, OE5BGL, XE1AE. 500 KP4CZ, I4UFH, OE5BGL, XE1AE, NE8Q. 550 ISØQDV, I4UFH, OE5BGL, XE1AE, KE6KT, DL1AM. 600 ISØQDV, I4UFH, OE5BGL, XE1AE, AC3T. 650 ISØQDV, OE5BGL, XE1AE, I8HZT. 700 ISØQDV, XE1AE, I8HZT. 750 ISØQDV, XE1AE, W4UW. 800 ISØQDV, XE1AE, W4UW. 850 XE1AE. 900 I2KKL, XE1AE. 950 XE1AE. 1000 XE1AE. 1050 XE1AE, KC8CC, NFØX. 1100 XE1AE. 1150 NJØC, XE1AE. 1200 XE1AE. 1250 XE1AE. 1300 XE1AE. 1550 K5UR. 1600 K5UR.

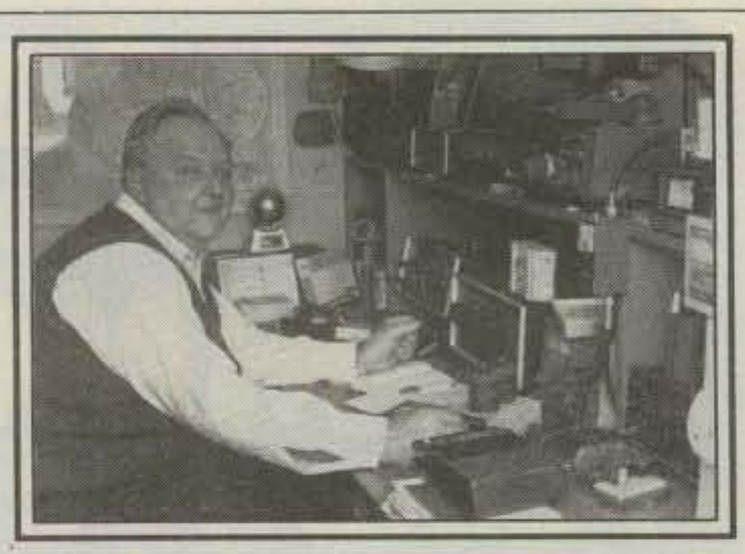
C.W.: 350 OH1MQ. 400 ISØQDV, OH1MQ. 450 G3VQO, ISØQDV, OH1MQ. 500 ISØQDV, OH1MQ. 550 OH1MQ. 600 DL1HBT, NE6I. 650 DL1HBT. 1000 W9VEN. 1100 DL1AM. 1150 I2DMK. 1200 LA7JO. 1450 K5UR. 1500 K5UR.

10 meters:	XE1AE, AC3T, KE6KT.
15 meters:	JA7FFN, XE1AE.
20 meters:	XE1AE.
40 meters:	SM5DAC, YU2LCF, XE1AE, KE6KT.
80 meters:	XE1AE.
160 meters:	KE6KT.
Asia:	KA7T, VE6VW, XE1AE, OK2BFX.
Africa:	XE1AE.
No. America:	KP4CZ, AC3T, K6UXO, VE6VW, XE1AE, W9IAL.
So. America:	W4ZYQ, XE1AE.
Europe:	KP4CZ, AC3T, YU2LCF, VE6VW, XE1AE.
Oceania:	XE1AE.

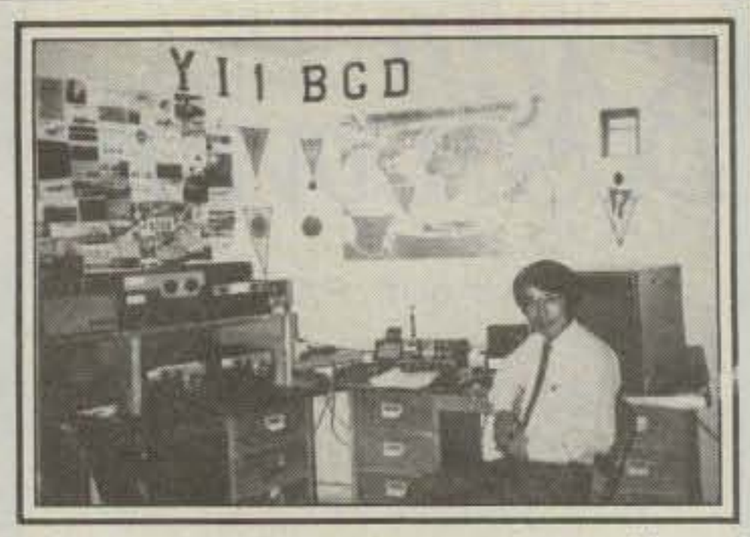
Award of Excellence Holders: K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I@JX, WA1JMP, K@JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YZ/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SMØAJU, K5UR, K6XP.

Award of Excellence Holders with 160 Meter Endorsement: W8CNL, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SMØAJU, KF2O, K5UR, OK1MP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.



Here is Dr. Emmerich Rath, OE3RE, the first OE-amateur on the air after the end of the Russian occupation in 1954. He was the first president of the OE-national society, a District Chief since 1960, and after his term as president from 1954 to 1960, he has been Honorary President of the group. He is a long-time DXer and holds a lot of cards for long-gone DX countries. The QTH is in Langenlois.



Here is JR1AIB at the operating position of YI1BGD in downtown Damascus. The gear is Drake plus an Atlas transceiver. Yasuyuki Inoue found the station was out of QSLs and the DX Family Foundation in Japan arranged to print and ship a hurry-up batch of QSLs to help needy DXers. YI1BGD says to send 3 IRCs for a QSL. Surface mail seems to evaporate enroute.

20° latitude from the pole, and how some years the ice pack did not clear its shores, and even when it did, it usually was only a few miles away. The Local nodded at all of this.

Then we mentioned how any landing would be difficult. Though the island was first sighted in 1821, it was not until a hundred years later that anyone made a landing, and that from a Norwegian research vessel in 1929. Another 50 years passed before another landing was made in 1982, a crew from a cruise ship making a landing after a similar attempt in the previous year had been unsuccessful. We mentioned that the island was of volcanic origin, and that a basalt flow reaching out into the ocean on the west side was considered the best landing site. That not too much was known about the island; it was only 11 miles by 6 miles, and its eastern side was largely uncharted. Also, that most of the island was covered by ice year round. This time we had the Local's attention. He was listening.

"But it will be a new country," he argued, "and all you have to do is work them. Any DXer worthy of his certificate should do it without trouble. After all, the path is directly south, right?"

Of course. DXers always think logically. One does not attain the Honor Roll without a lot of deep thinking and know-how. Maybe even some worry in the long hours of the night. We thought we might add to that worry. "Don't you think that the preparation, the size, and the makeup of a DXpedition will have a bearing on its success? Things like the number of operators, gear, generators, antennas, operating positions, food and shelter, and things like that? What do you think?"

We were getting the Local close to where we were leading him. He was thinking. For a bit he didn't even bother to speak. When he did, there was a different tone heard.

"Well . . . well maybe there's something to what you say. Seems like I recall hearing about someone off a fishing vessel planning to activate Peter I Island, and that he'd only operate for a couple of hours. Is that what you are thinking about?"

We did not bother to deny anything, but then again, we did not admit anything. The thought was that this one would enjoy worrying, and he was well on his way. "And wasn't he from? . . ." the Local asked. "Why that country must be halfway around the world from Peter I Island. Isn't it?"

"About 130° removed," we offered in assurance, "not quite halfway. Possibly the beam heading from the homeland will be somewhat above southeast, but definitely not a north-south path. Definitely!"

The Local continued thinking. One could almost hear thoughts thundering through his head. " . . . single operator . . . minimum equipment . . . short operation . . . dangerous sea conditions . . . possible ice pack . . . the bottom of the sunspot cycle . . ." Almost we could hear the groans developing. "Peter I might be tougher than I thought," he finally said. "What do you think?"

What did we think? That DXers can develop into big worriers when given the opportunity. One in the lower reaches of the Honor Roll learns easily to worry about the possibility of a new one showing and it not being worked by him. Add the deletion of a hard-earned and cherished country and the void is felt. One again learns that DXers have a lot to worry about, and some more so.

The WAZ Program

20 Meter CW

236	JR2CFD	238	KE9U
237	HB9CSA		

15 Meter Phone

228	JJ3WUG

All Band WAZ

S.S.B.

2999	JA3DOT	3001	VE7HAM
3000	DL1NP		

C.W. and Phone

5926	WB4CSK	5930	DL2HAZ
5927	I4FGG	5931	WB5BIR
5928	DF9ZA	5932	HB9APJ
5929	DK3JB		

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

5 Band WAZ

Standings as of January 1, 1986

All 200 zones worked:

1. ON4UN	38. IV3PRK	74. N4KG
2. K4MQG	39. DJ6RX	75. YU7DX
3. SM4CAN	40. OH3YI	76. DL8MAG
4. AA6AA	41. I4RYC	77. OK3DG
5. W8AH	42. ZL1BIL	78. ZL1BOQ
6. W6KUT	43. I4EAT	79. EA9IE
7. EA8AK	44. ZL1BQD	80. DL7HZ
8. LA7JO	45. TG9NX	81. DJ9RQ
9. EA3SF	46. XE1J	82. EA5SP
10. OH1XX	47. F5VU	83. EA2IA
11. EA8OZ	48. W3AP	84. SP3BQD
12. W0SD	49. YO3AC	85. LZ1NG
13. K0ZZ	50. K3TW	86. N4JF
14. ON6OS	51. XE1OX	87. CT2AK
15. OK3TCA	52. VE7IG	88. HB9CIP
16. K6SSS	53. OK1ADM	89. OK1MG
17. ZL3GQ	54. CT1FL	90. CT4BD
18. OK3CGP	55. WA1AER	91. VK6HD
19. SM0AJU	56. N4RR	92. EA6ET
20. OZ3PZ	57. UW0MF	93. VK3QI
21. I3MAU	58. W4DR	94. LZ2DF
22. I2ZGC	59. OK1MP	95. ON4QX
23. 4Z4DX	60. W1NW	96. SM0DJC
24. N4KE	61. OE1ZJ	97. CT3BM
25. K5UR	62. HB9AHL	98. K2TQC
26. K9AJ	63. HB9AMO	99. EA8XS
27. SM3EVR	64. LA6OT	100. HA9RE
28. LA5YJ	65. UR2QD	101. SM4CTT
29. DL3RK	66. UK2RDX	102. A71AD
30. N4WJ	67. ZS5LB	103. LZ2CC
31. G3MCS	68. F6DZU	104. SM4CLE
32. SM5AQD	69. DL4YAH	105. LZ1HA
33. W0MLY	70. LA7ZO	106. SM5AKT
34. I0RIZ	71. W9ZR	107. CT4NH
35. ON5NT	72. W1NG	108. ZL4BO
36. OH6JW	73. VK9NS	109. I1BSN
37. OK1AWZ		

The top 14 contenders for 5 Band WAZ are:

1. DK5AD, 199	8. LU9GV, 198
2. JA1BWA, 199	9. W6GO, 198
3. JA3EMU, 199	10. K4CEB, 198
4. N4WW, 199	11. W2YY, 198
5. K6YRA, 199	12. G3GIQ, 198
6. W8UVZ, 199	13. K7UR, 198
7. LU8DPM, 199	14. W3GG, 198

349 Stations have attained the 150 zone level

We know some DXers who have been heard to say: "Those Sixes don't have big linears, they have big advertising budgets!" This is refuted hotly, the claim being is that all they are looking for are a few good DXers. Here is Tim Chen, BV2A, at the operating position in downtown Taipei. Take a look at that T-shirt! Looks like the Northern California DX Foundation found another one!

"Well," we hastened to add, "look at the bright side. After all, it was but a hundred years after Peter I Island was discovered that anyone landed on it. It took only half that time, 50 years, for the next landing. Things are improving. And one would hardly expect that a one-man, even a two-man, DXpedition would think of making any prior arrangements with the locals back home so that they could work each other on prearranged frequencies and things like that. Hardly seems possible, not at all. And just because some on a big DXpedition a year back spent the available time looking for friends on a somewhat esoteric mode, one would hardly think that others might get similar ideas, would you?"

There were a few more items to add—things like working a mediocre path back home, the time spent dredging down in the noise level for a favored call, and even to mention again the short time, possibly only hours, of some planned operations and the problems of landing from an inflatable boat in Antarctic seas.

"It certainly will be a time to remember," we cheerfully said. "After all, there have been more people at either the North or South Pole than have ever been on Peter I Island. Think of that! Work that island and you will really have worked something difficult. Certainly it will be more difficult than Bouvet, and you will recall how over the years most every needy DXer has worked that one, right?"

Perhaps we were going too far. We really had the Local worrying. We were also getting the feeling that he might have heard enough about Peter I Island. Finally he raised his face, and it was not the happy, confident one that had greeted us. All he could say was, "Why do they do such things? Why?"

This time we were ready. "Because DXers want new countries, and because it does seem to meet the criteria, or something. You might check to find out who supported the idea. That might help you to understand things. There are probably good reasons, and after all, haven't we been talking about how DXers always have the worries, and won't this be a good one? Good to worry about," we hastened to add.

By this point the Local had had enough. And we were getting reluctant to crush that bold spirit often heard flaunting 'the firstest with the loudest!'" So we asked, "Want to head up the hill and visit the Old Timer? Maybe you can ask him about what he meant when he said DXers worry about being bumped from the Honor Roll by deletions. Maybe even we'll be asking about that new country that's coming."

The Local only shook his head. Let's forget it," he said. "I think I've gotten the idea about worrying. Do you think any others DXers might be worrying about Peter I Island? What do you think? Are they worried?"

Long ago we concluded that worry is the territory of the young. We might admit that we know some grandfather types who worry, but as DXers, these are still considered youngsters. One even suspects that the cry "Don't let 'em take it from you!" might be heard more often than its parallel, the wistful "Do you think I'll ever make it to the top of the Honor Roll?" or its twin "Do you think I'll ever even make the Honor Roll?" DXers show an unbounded faith in the future and always believe that the sunspots will return . . . again. They expect to work every new country the first time it shows—always! And they never worry about having to work a new country the second time it is on the air. They figure they will get it the first time.

The Local finally left on his weary way down the hill, oblivious to the beauty of the springtime foliage and the lush grasses on the hillside. As he disappeared around the curve of the hill, we were thinking that maybe we'd just drift up the hill and visit the Old Timer. We thought we might ask if he thought we had a chance to work Peter I Island the first time it showed. Maybe we'd even ask whether DXers should worry about their totals being reduced by deletions and if they might be bumped off the Honor Roll. But then again, we had to tell ourselves that those on the Honor Roll have special worries. But we had to admit to ourselves, as long as we were carrying on this two-way conversation, that Peter I Island might prove to be something interesting. Perhaps very interesting. But that we'd worry about it some other day.

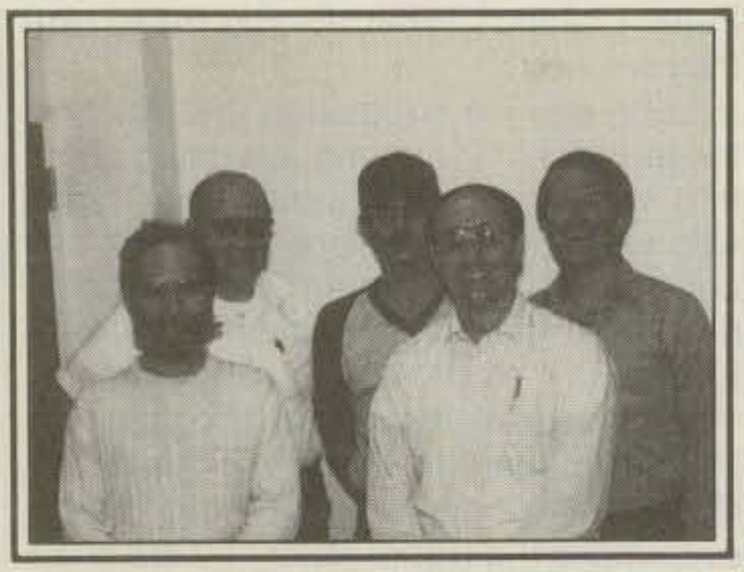
50th Anniversary WAZ

W4KA, Leo Haijsman, the guardian of WAZ, reminds DXers that a special WAZ certificate is being offered for working the 40 zones during 1986, this to commemorate the 50th anniversary of WAZ. There will be a plaque given to the first winner of the anniversary award. Sequentially numbered certificates starting with #1 will be awarded to all winning the WAZ-50. The regular WAZ application form can be used. All contacts, SSB or CW, on 10, 15, 20, 40, 80 meters are valid. The WARC bands 12, 17, 30 meters are not. Write to W4KA with SASE for forms and full information. (Also see the rules in the February 1986 issue of *CQ*.)

The International DX Convention

Amateurs from the People's Republic of China will be at the big International DX Convention at Visalia late in this month of April. The usual attendance by overseas amateurs is expected, and it will all come together April 18th to 20th at the Holiday Inn in Visalia.

Frank Cuevas, W6AOA, is the Grand Chairman again. The Southern California DX Club is the host club for this gathering. Jim Rafferty, N6RJ, will conduct the DX Forum, and Dick Norton, N6AA, will preside at the Contest (DX) Forum. There will be other seminars and lectures. Lloyd and Iris Colvin will be home from their African travels for this gathering.



The Western Pennsylvania DX Assn has been among the top DX clubs for years. How does that happen? It's the officers and here they are for 1986. In the back row from the left is Treasurer Don McDaniel, KJ3Q; President Mike Zilavy, KC3MR; and DX Consultant Doug Stark, WA3CGE. In the front are Jan Ditzian, KX2A, and Newsletter Editor John Getz, AD8J. Al Houston, N2MA, and Mike Cheppoinis, K3MC, missed the photo session. The club repeater is at 145.37 MHz and covers the tri-state area around Pittsburgh.

Hotel reservations are best made by going directly to the hotel. The registration for the convention is handled by Don Bostrom, N6IC. Until the end of March registration is $38.00, and then it goes to $40.00.

This is a DX convention, nothing but DX. Over the years some DXers note that the reason for attending might change. Initially one goes to learn about DX and meet other DXers. Later it seems that one goes to meet DX friends from around the world. There is nothing to compare with meeting a DX friend from overseas for the first time. You can meet a lot of them at these international DX meetings. It is a gathering which emphasizes again that DXers are the true internationalists of amateur radio, or anything else for that matter.

Dropped, or Deleted!

Many and mysterious are the ways of DXing. Some say that this is true of many DX things that happened in the past. But if one persists, one may learn of the Eternal DX Truths, though it probably won't do much but to inform you.

Some months back there was mention of Wrangell Island and how no one ever worked it. Jim Maxwell, W6CF, who knows most everything about DX, notes that there is another and earlier instance such as Wrangell, this being mentioned in *QST* for June 1955. All that is said, among other things, is that Wallis and Futuna Islands (FW8) will be a new country and Tannu Tuva is deleted. As is the case with Wrangell Island, you will not find Tannu Tuva anywhere in the DXCC country list. No one ever worked it and got credit for it. The routine is that if someone gets a credit for a country, it is listed as "deleted" when removed. If no one worked it, it is "dropped" completely—not even mentioned in an historical footnote and remembered only by old DXers as "the only one I ever missed!"

Where is—or was—Tannu Tuva? Not in the South Pacific. If you look at the map of Outer Mongolia, on the northern border there is a dip, and above there most maps will show the city of Kyzyl. There it is. Old Callbooks show it as having a TT-prefix. The former Tannu Tuva is that part of Siberia above the Mongolian border, Kyzyl being the principal city. The area was made an autonomous region of the USSR in 1944. In 1961 it became an Autonomous Soviet Socialist Republic. You might also note it as being in WAZ Zone 23, a bit different than expected. Over the years this has been a point of interest, especially when China was not available for the Deserving.

W6CF also notes that Little America was "deleted" in the September 1948 *QST* and all of Antarctica added as a country. It might also be noted that the Honor Roll on that date had a total of ten members—eight W's and two G's. Top of the Honor Roll was 190 countries and bottom was 165.

The use of "deleted" or "dropped" seems to have been used interchangeably over the years, though the present practice is to use "deleted" when the country has been worked and "dropped" when it has not. "Dropped" countries will not be found in the deletions.

This might wind up a discussion that started about a year back among DXers when W6AM became a Silent Key. There have been two countries on the DXCC country list which were never worked for credit: Wrangell and Tannu Tuva. Subsequent to their being dropped, they have been worked by DXers, but as it is often said, "too late, too late."

Aruba

This Netherland Antilles Island became independent at the start of the year, and the prefix P4 was turned over to it. This prefix was previously used as a prefix for special events in the Antilles. Now it belongs to Aruba. There will be five islands remaining in the Netherland Antilles group, and among them will be Curacao, Bonaire, and St. Maarten.

W1BIH was down in the Caribbean during the first part of this year and as usual showed in a number of DX tests. In the ARRL February CW test he signed PJ9J. You might also catch

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2857	YU2DX	1790	N2AC	1423	WA8YTM	1156	CT1LN	905	W0JIE
2767	F9RM	1782	SM7TV	1415	K8LJG	1151	W7CB	883	WI4K
2574	W2NC	1675	I2PHN	1397	N5TV	1151	G4FAM	875	VE2PD
2501	K2VV	1668	I6SF	1384	PY4OD	1131	YU2CQ	869	NE6I
2426	K6JG	1650	I8YRK	1322	N6JM	1126	YU4YA	856	K7CU
2346	K6XP	1644	YU7AW	1317	SM6DHU	1110	SM0AJU	853	DF6EX
2271	VE3XN	1637	I2PJA	1283	KL7AF	1090	N4IB	849	JH8NYK
2166	W4BQY	1632	W8CNL	1268	PY1APS	1079	N8BJQ	834	I0AOF
2150	N4MM	1620	K9BG	1263	IS0LYN	1074	K2POF	824	PY1DFF
2134	W9DWQ	1614	W0SFU	1255	DK5AD	1063	KC8CC	804	KX1A
2075	YU2TW	1597	KF2O	1243	N4NX	1028	W5PWG	801	SV1PL
2042	N4NO	1586	I3ZKD	1231	W6OUL	1016	N2AIF	799	KO2Q
2014	YU7BCD	1531	W1NG	1226	I2MQP	1007	AI6Z	752	JH4UVU
1931	N9AF	1530	YU7KV	1224	N6AW	1002	3A2LF	749	OE1KJW
1929	N6JV	1518	K7NN	1220	LA7JO	950	W6YMH	745	VE6VW
1876	N6CW	1516	WA1JMP	1191	YU7AJD	947	WD4RAF	719	K8HF
1869	K5UR	1514	IN3ANE	1189	JH1VRQ	923	VE5ADA	650	JO1BMV
1855	N4UU	1505	W9NUF	1181	K2QF	911	AI8S	633	N3KR
1792	YU1DZ	1473	K6ZDL	1168	WB8ZRL	907	YU1SZ	607	KL7VZ
1792	YU7BPO	1457	EA2IA						

SSB

2701	F9RM	1573	W9DWQ	1130	NJ0C	995	WB8ZRL	767	K3IXD
2267	I0ZV	1546	PA0SNG	1128	W9NUF	992	HI8GB	759	WB6SRK
2120	K6JG	1525	N4NO	1108	W2CC	967	LA2TO	755	WO4L
2089	K6XP	1524	W4BQY	1099	N5TV	948	KK0L	744	EA5BCX
2047	ZL3NS	1372	N2SS	1091	KC4OV	942	XE1XF	715	I8WYD
2021	I0AMU	1370	WA4QMQ	1083	ZP5JCY	933	K9LJG	714	SM0AJU
2011	K2POA	1348	CT4NH	1079	I8KCI	923	K5RPC	704	K8ZZU
1961	K2VV	1339	KF2O	1078	ZP5RS	908	I0SGF	698	KK5P
1937	N4MM	1334	VE1YX	1078	XE1OX	908	CT4UW	692	XF4MDX
1757	I8YRK	1303	CT1FL	1075	I1POR	904	WA2FKF	687	W6YMH
1751	I4ZSQ	1287	WF4V	1073	N6FX	902	W3GXK	680	K9BQL
1736	CT1UA	1266	I6NOA	1060	TG9GI	898	N4IB	662	TI2KD
1735	W0YDB	1228	I2MQP	1045	KL7AF	896	PY4VX	659	I4UFH
1699	WD8MGQ	1212	PY3BXW	1032	KC8CC	878	WI4K	654	EA8AKN
1688	OZ5EV	1204	W3ARK	1029	N2AC	866	PY4OD	649	AI6Z
1657	YU7BCD	1173	WA4OIB	1025	JH1VRQ	862	CT1BY	646	OE5BGL
1633	I2PJA	1164	W1NG	1023	EA2IA	857	VE2PD	621	AG2K
1602	I6ZJC	1158	W2NC	1017	I4LCK	836	W0ULU	618	CT1BWY
1596	I8KDB	1147	G4CHP	1016	KC8YM	809	W4UW	615	N2AIF
1593	K5UR	1142	AC2J						

CW

2346	W2NC	1551	N2AC	1130	JE1JKL	852	I7PXV	689	OE1KJW
1915	N6JV	1486	N4MM	1122	I1YRL	846	AK2H	659	VE4AEX
1907	WA2HZR	1482	K5UR	1108	PY4OD	825	NN4Q	654	W0JIE
1843	K6JG	1436	I6SF	1102	KA7T	818	AI6Z	648	W9PWM
1828	K2VV	1422	LZ1XL	1101	IT9VDQ	811	N2AIF	645	PA3CKO
1795	W8KPL	1376	VO1AW	1097	N5TV	800	JH1VRQ	643	N4IB
1779	N4NO	1329	W4WJ	1011	IT9VDQ	790	YU2CQ	633	ZS6BCR
1765	W9DWQ	1290	K9QVB	1006	W1NG	769	G4FAM	628	W6YMH
1739	K6XP	1281	YU3NP	995	KF2O	765	WD9IIC	614	KQ8J
1736	W3ARK	1241	N4YB	960	K8LJG	755	N4NX	611	VE1ACK
1702	W4BQY	1177	K6ZDL	943	KL7AF	725	SM0AJU	606	JA2JCW
1678	G2GM	1162	I2DMK	919	K2POF	723	SM5DAC	605	LA7JO
1608	YU7BRD	1159	N6FX	918	AK9Z	717	F6HKD	604	NE6I
1598	VE7CNE	1156	W9NUF	883	DJ1YH	692	KN7K	603	K8YRK
1592	DL1QT	1137	EA2IA						

CQ DX Awards Program

S.S.B.

1450	KA8OUT	1453	G4VZQ
1451	AC3T	1454	K9AB
1452	KG6IP		

C.W.

651	I7PXV	652	K9AB

S.S.B. Endorsements

310	OK1MP/315	300	W6NLG/304
310	ZS6LW/314	275	WD8PUG/294
310	W9BW/314	275	W9NUF/293
310	YU1DZ/313	275	K1VHS/292
310	K4XO/312	275	N1ALR/282
310	K6XP/311	275	KØHQW/276
310	K9AB/311	275	VE5FX/275
310	EA2IA/311	250	KSØZ/274
300	K8NA/308	Mobile	K9DCJ
300	KV2S/307	3.5/7 MHz	N1ALR

C.W. Endorsements

310	N6AV/315	275	EA2IA/297
310	DL7AA/315	275	K1VHS/281
310	K9AB/313	275	W9NUF/280
310	K4XO/311	200	I7PXV/216
300	OK1MP/308	1.8 MHz	OE1KJW
300	WB4RUA/300		

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

him as W1BIH/PJ2 outside the test periods. Should you need a QSL for the call used in the past but not this year, P42J, all of those shown above go to W1AX (SASE needed).

Heard Island

Jim Smith, P29JS, in his newsletter notes that the ships that visited there a few months back had a bit of trouble getting away. One vessel took a lot of help, including a Japanese icebreaker, to escape the ice. Jim also notes that the plans are to have a permanent base on Heard in the future, and things should improve for DXers when that comes off.

There has been a Public Broadcasting System program "Voyage to the White Volcano," which tells the story of the 1983 expedition. While a lot of the footage is not about DXing or amateur radio, there is some and you should recognize Al Fischer, K8CW, in some of the shots. As these programs do keep coming back, you might watch for it.

If you are awake at that hour, you might try checking in on the P29JS activity, 0630Z at 14220 kHz, and possibly learn of some of the current DX activity.

WPX

With all the new prefixes coming on line, one WPXer was heard to mutter that he did not care whether or not the sunspots ever returned. Though that might not be a universal feeling, there are some who rush to the shack at every possible moment looking for new prefixes. You may run out of new countries, but it does not seem possible you will ever run out of prefixes.

Norm Koch, K6ZDL, who runs the WPX program, reports that the business was brisk in 1985. There were WPX certificates issued as follows: CW WPX 40; SSB WPX 78; Mixed Modes WPX 55; WPNX 3; VPX 7; and Award of Excellence 8. Regretfully Norm notes that there were some disqualifications for failure to forward QSLs to the authorized *CQ* checkpoint or for falsifying, altering, or even counterfeiting QSL cards.

In 1985 the WPX file was computerized for those claiming over 1000 prefixes. The computerization helps to keep down duplication and some other problems. While some have suggested that all the files be put into the computer for WPX below the thousand mark, no decision has been made on this because of the amount of time it would entail. Those who might wish a copy of their printout, and this is available only to those over the 1000 WPX mark, write to Norm and get the details and cost. He changed residence a few months back, something always dreaded by a DXer, but the post office box address is still the same.

Eighty Meter DX

N6AN has been noted in some club bulletins as pointing to the 80 meter DX season coming with the bottom of Cycle 21. This is one season that does not come every year, but while it is here, DXers working the low frequencies want to make the most of it.

As the band does not run all the way up to 4000 kHz in all areas, it helps to know the frequencies where DX stations may be lurking, impatiently waiting for your call. Hal, N6AN, says to try:

	CW (kHz)	Phone DX (kHz)
Africa (most)	3500–3600	3790–3810
LU/CE	3500–3750	3740–3750
Asia (most)	3500–3600	3790–3810
Australia	3500–3600	3690–3700
Canada	3500–3725	3750–3800
Europe (non-USSR)	3500–3600	3750–3800
USSR	3500–3600	3640–3750
India	3650–3700	3675–3700
Japan	3500–3550	3793–3803
New Zealand	3500–3600	3775–3825
South America (most)	3500–3600	3775–3800

This will narrow things down a bit, and if you are working for any of the awards, the time is near to really clean up. Once you have nailed them, you can spend the rest of the cycle telling others how easy it was.

IRCs

From time to time there is mention of a country not accepting IRCs for postage. Have no doubt, as this does happen. Also, have no doubt that they should.

Years back when we were in that post office trade we took up the matter of the USSR not showing in a list referring to IRCs. We went right to the one in charge at L'Enfant Plaza, writing on official post office stationery, of course. Specifically, we asked if some countries do not honor IRCs and why. We got a quick answer.

In the case in question, the USSR, we were told that the USSR was not shown in the table to which we referred only because they had not established an IRC rate for airmail service. Otherwise, any country in the world has to accept IRCs. It is part of the Universal Postal Union Treaty, and if you plan to move mail beyond your own borders, you had better belong to the UPU.

In cases where they are refused, it is usually because of unfamiliarity. In some instances checked out, the postal clerk did not know what the coupon was. It might be a bit difficult to believe, but window clerks can go years without ever selling an IRC. On the other hand, there are a number of postal items which are seldom asked for. One recalled from way back was international reply double postals. No one ever asked for them.

So what do you do when someone rejects your IRC? You can talk to the person in charge of the postal unit and, if necessary, ask that the postal manual be brought out, the index "International Postal Union Coupons" be located, and the reference read. Or, you can find a place where a DXer lives and do your business there. Come to think of it, it is hard to recall anyone but a DXer ever buying IRCs. However, they are good everywhere. Now that you know it, just make sure you convince all those others who do not. On the other hand, IRCs go for 80¢ now at the local outlet. Tossing in a handful of IRCs to ensure a needed QSL can be expensive.

Travelers Century Club

For longer than some old-time DXers can remember, DXers have been considered by some of the uninitiated as being a quart low in their unending search for DXCC countries. Who has not heard the questioning incredulity: "What? Three hundred and fifteen countries? There are not that many in the world!" Maybe not for the common folk who only acknowledge those in the United Nations, and they only have 159 members. But it is time for DXers to move over a bit. The Travelers Century Club based in Los Angeles has their own competition, and they have 308 countries! And many will be familiar to DXers.

To gain credit in the TCC you have to do more than work them. You have to visit them. And they do include on their list familiar places such as Bouvet, Fernando de Noronha, San Andres, Pitcairn Island, North Korea, and such exotic stops. One clever fellow has been off visiting all the South African homelands in the anticipation that those homelands will become TCC countries.

The top country traveler stands at 299. This resident of Akron, Ohio went out to Bouvet to gather that one as a counter, but the sea was too rough to land. He will have to try that one again. Another top contender is figuring out how to get into Albania. One club member tried to get that counter by swimming ashore from a boat. A bullet bouncing nearby dictated a quick change of objectives—back to the boat. One sneaky type added North Korea to his total by crawling under the conference table at Panmunjom, the table sitting astride the dividing line.

One top TCCer has been working at the project for 28 years. Somehow a lot of this has a familiar overtone. Maybe we met some of these TCCers along the way. DXers! We are not alone.

Some Springtime DX Notes

Needed countries vary depending on locale, and it is sometimes surprising to find that Europeans have difficulty with the Pacific and the JAs with the Caribbean. But get to the real difficult ones, and they start falling close together. The *DXPress* out of Europe finds ZA, 3Y, 7O, VU-A, and XV as the top five in mixed modes, and ZA, YA, 7O, VU-A, and 1S in CW.

The *DX Bulletin* in the list compiled some months back found in the mixed modes the need running from ZA, 7O, 3Y, VU-A to XV. Some of these countries have been on most everybody's list for years. Some in the top ten at one time were garden-variety DX. These might include YA, XV, XW, 5A to note some. Even the Andamans had a number of stations back about 15 years or so. Things change, including needed countries.

The FCC a couple of months back tightened up some loopholes by stipulating who cannot avail themselves of third-party communications. This is to plug the gap whereby those with suspended amateur licenses continued to be on the air via phone-patches, someone else's rig, and things such as this. It's all in Part 97.114(c).

Elsewhere we mentioned Tannu Tuva. *QRZ DX* notes that UA0YM has been heard at 7015 kHz after 0250Z as well as RV0YF at 7006 kHz from 0230Z. LA9WT is with an Italian Antarctic effort and has been heard from Terra Nova Bay in the Ross Sea. Jon Erik Fadnes has been heard signing 3Y9WT, and if you worked him, QSL to his home QTH; his home call is LA9WT. Jon has also signed JW9WT and JX9WT on other efforts. Mostly he works CW and should be heard well into the spring here, though winter comes early there. The 3Y call did get some attention, but it is Antarctica.

Some of the older DX types might recall Maria Theresa and other interesting events. It might be interesting to note that it still showed on some NOAA as late as 1978 on Chart 2683 In 1983 the location was moved from 151°13W to 136°39W after a study of the log from the New Bedford whaler *Maria Theresa*, and its report of sighting the island in 1843.

The sunspot cycle continues to decline, though there was a brief upsurge just before the end of the year. Pat Hawker, G3VA, writing in the RSGB *Radio Communications* magazine, noted that recent cycles have bottomed in mid-year. Thus he asks the question, "Did Cycle 21 bottom last June or is the bottom to come this June?" Of course it could come some other time, but it does seem the end is near. It is something like ten years since the last bottom. The cycle is supposed to run 11 years, but that is not always the exact period. Sometimes shorter, sometimes longer, but 11 is a good average.

What do you do? Head for the lower frequencies. There is a lot of action to be found at the bottom of the cycle. *Inside DX* reports FB8Y, FT8XA, UI8BAA, ZD7AL, 5L2EQ, and UH8HAI recently heard on 40. *QRZ DX* notes CU2CE, EA8ADP, EI1CN, FO8LQ, RA0FA, TF5TP, and a lot more on 80. Even 160 has a lot going.

On the daily basis the words of W6PHF, muttered through a full beard in the depths of Silicon Valley, should always be remembered. "Check WWV at 18 minutes after the hour. Get the Alpha and K Indexes. If the Alpha Index is below ten and the K Index two or lower, you will work DX. When the figures go up, the DX goes out." Listen, and if the Alpha is over ten, and it can go as high as 100, anything over ten will indicate poor conditions. Get the Alpha below ten and the K two or lower and you have real-time DX information. You can analyze a lot of information, but it will be a bit difficult to find a better instant DX appraisal than the WWV reports.

With the cycle at a low, one can still point out the eternal truth that DXers need information. DX knowledge is layered on old DXers. They accumulate it over the years. If you are thirsting after DX knowledge, check your reading habits. It should include *QRZ DX*, *The DX Bulletin*, and *Inside DX* (436 No. Geneva, Ithaca, NY 14850) for fresh and breaking DX news. It should include the "W6GO/K6HHD QSL Manager List," *WORLDRADIO* for general radio news, and the unequalled *Westlink* for inside information about amateur radio and radio in general. The W/Ks have access to DX information probably unequalled anywhere else in the world. But, as they often say, "We need it!" It might also be noted that if you keep your file of *CQ* magazines, you will find a lot of valuable information on antennas in the special issues devoted to helping you with that needed item. A good antenna is always a joy—maybe even a necessity.

73, Cass, WA6AUD

DX Ten Years Back

In April 1976 Bill Rindone, WB7ABK, was signing ZK2AQ from Niue and heading for Christmas Island, where later in April he signed VK9XX. Bill also signed A35NN from Tonga. The Colvins were out, even then, and had been signing FK0KG from New Caledonia and were planning YJ8 New Hebrides if they could get the paper problems straightened out. The uproar continued over the new country of Okino Torishima with a lot of the outcry coming out of Japan. Rumors were being passed around that Clipperton might be heard one of those days and that two French operators had permission to land and operate. Keep in mind that back then Clipperton had not been heard for about 20 years, give or take a couple. VQ9HS/3B6 was on from Agalega Island for two hours and eight minutes. He was using an auto battery for power and WN3SHX was the operator.

QSL Information

C07GC to C07RG
CV0D to CX1AA
CT3EU to G3PFS
CY0SAB to VE1ASJ
DL1RK/CT3 to DL1RK
DK9KX/S9 to DK9KX
EL2AY to N5GAP
EL2EF to KM8E
GI0AIJ to GI4WXA
N8AQV/HP1 to K8PCZ
H5FXT to VE3FXT
HP1XKR to JA7AGO
HP1XKT to JA7AGO
J34PN to N4PN
J34UEE to K4UEE
J87A to N4PN
KH0AC to K7ZA
LX9BV to DL7MAE
N5CJB/5N1 to K4ZKG
OH2BEN/C56 to OH2BEN
P43A to Bureau or PJ3AJ
PA0FM/P4 to W2NHZ
PA2FAS/GU0 to PA2FAS
PZ5ES to KX2O
PJ9J to W1AX
P42J to W1AX
P44B to N2MM
PY4W to N2MM
SW2UA to SV2UA
TN8EE to F6ECE
TU2NG to N5GAP
TU4BR to KN4F
V3CAI to K0RWL
V2ACW to WB4OSN
VG1WF to VE1WF
VK2EVP/LH to JA1WSA
VP2MM to AB1U
VP2MW to WA6AHF
VP2VA to VE3MJ
VP2VEG to N6ZZ
W6REC/VP2M to WA6AHF
VP8GBO to G0BAU
YT7A to YU7GMN
XX9DX to VS6DX
3X0HAB to DL8CM
4N3AP to YU3AP
4O0IYY to YU2AKL
5T5SL to DL8DF
5U7CC to DK9KD
5V7RW to WB4LFM
6W1LL to DL1HH
6W1NQ to DL1HH
6Y3M to KT3M
7P8BE to VE3FXT
8P9AF to VE3LGI
8P9AG to K6ZM
EL2AY to Carol McClure, 3428 Kilrush, Arlington, TX 76014
ED8RSM to Box 275, Maspalomas, Canary Islands
FR4DN to Mondon CD-16, Avirons, 97425, Reunion Island, Indian Ocean
FT8XB to M. Monseal, BP 83-F, 95103 Argenteuil, Cedex, France
FW8AF to F. Catala, BP 92, Matautu, Wallis Island, Pacific Ocean
JW5AD to R. Gallion, 10772 Avenida Roberta, Sprir:g Valley, CA 92078
K1CTK/TU to c/o American Embassy, Abdijan, Ivory Coast
J6LPT to Box 195, Casreiwa, St. Lucia, West Indies
SV8CS to Box 123, Tante Island, Greece
H5AY Weldom Radio Club, Box 472, Welkom, 9460 Republic of So. Africa
HP1XKR to Takao Togashi, 4-48 Shogunno, Higashi 1-chome, Akita-city 011 Akita, Japan
HP1XK to Takao Togashi, 4-48 Shogunno, Higashi 1-chome, Akita-city 011 Akita, Japan
TU2NG Carol McClure, 3428 Kilrush, Arlington, TX 76014
VK2EVP/LH to Y. Aoki, 1793-164 Kanamori, Machida City, Tokyo, Japan
ZD8LIK to Steve Hurst, c/o BBC, Ascension Island, South Atlantic
ZD7XY to Box 54, St. Helena Island, So. Atlantic

First licensed in 1978, Elicio Munoz L., XE1OX, has quickly accumulated all the major DX Awards. Elicio has added the 5BWAZ #51 to his list of DXCC, Honor Roll, 5BWAS, 5BDXCC, and a handful of others. An economist living in the Mexico City area, Elicio has worked hard on an efficient antenna system and it shows. XE1OX is shown here in his shack with his XYL.

5 Band WAZ No. 51

Elicio Munoz L., XE1OX, is the second XE to win one of the most difficult awards for DXers, 5 Band WAZ. Elicio did all of this within five years of getting his first license, that coming in April 1978.

XE1OX lives in the Mexico City area and is an economist. He is married, and he and the XYL have three children in the home in Coyoacan. Among other awards, Elico is a DXCC Honor Roll member, has 14 MHz WAZ #333 SSB, has the WPX Award, USACA, DXCC, 5BDXCC #1220, 5BWAZ, and a handful of others. SSB is the main operating mode, though CW is used maybe about 30% of the time.

As is the case with many successful DXers, Elicio had always been looking to upgrade his antennas. He started with a Hy-Gain TH3Mk3, moved to a TH6DXX, and now uses 3-element monobanders for 10, 15, 20 meters, 4 phased verticals, and 2 bazooks for 40 meters. On 80 it is three bazooks pointing NE, NW, and SE. He has two Yaesu FT-101E's with VFOs, two towers with tail-twister rotors, and a long list of auxiliary gear.

The noise level in the Mexico City area can be a problem at times, and it gave Elicio problems in cornering all the needed 40 meter counters. He attended school both in the U.S. and Mexico, including six years at the university there for his advanced degree. Along the way he had six years studying French and two years each of Italian, Russian, and Portuguese. While the higher frequency beams are stock items, on the lower frequencies Elicio built the antennas himself. He is the only operator in the family and belongs to the Mexico City DX Club. This is the group that has put Revillagigedo Island on the air a number of times. Elicio is also the custodian for the awards program of the Mexico City DX Club.

XE1OX took his DX where he could find them, and when all else fails he keeps an ear on the DX Nets. He says that on 10 meters this was almost a necessity, as without help it might have taken him three or four more years to corner all the needed cards. He is often working with the local club in contests, often with the club call XE1MDX. There's the profile for a successful 5 Band WAZ effort. A well-rounded amateur, Elicio certainly brought a high level of technical competence to the effort.

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

I had hoped to have some information about the SP DX Contest which normally is held the first and third weekends of April, but my letter to the PZK has not been answered as of this date late in January. My suggestion would be to look for some SP CW activity on April 5–6 and SSB on April 19–20. Maybe by next month I will at least be able to tell you where to send your logs if the PZK did have a contest.

A brief and quick review of our 160 CW Contest last January. Propagation-wise conditions were very good to excellent, and we are going to see some fantastic scores when the results have finally been tabulated. The stateside "Big Guns" created their own pileups and were knocking off the DX by the scores. The rest of us had to dig for the DX in the stateside QRM.

Thanks to Riki, 4X4NJ, Martti, OH2BH, at CT3, and Jeff, K1ZM, at ZL3GQ it was possible to WAC on the top band during a contest weekend. The other three continental areas had plenty of activity and presented no problem. I was lucky to make it between sunset and sunrise on the first day of the contest. I am sure that dozens of the fellows also made it. It will be interesting to see who will come up with the shortest period of time it took them to WAC. (We're talking about 160 meters, fellows, something that was unheard of for the average station a few years ago.)

I will not go into any details about some of the other happenings during the contest weekend. I will leave that for Don, N4IN, when he reports the final results. It was quite evident that many contesters from the HF bands are now flexing their muscles on 160. Unfortunately, the example set by the arrogance of a few of the "new kids on the block" turned the DX Window into a QRM jungle. We can no longer refer to 160 as the "Gentleman's Band."

Deadline for the July issue is April 15th, and May 15th for the August issue. And as I keep reminding you, please send it to my home address.

73 for this time, Frank, W1WY

Tennessee QSO Party

2100Z Sat. to 0500Z Sun., March 22–23
1400Z to 2200Z Sun., March 23

The Oak Ridge ARC, a member of the Tennessee Council of Amateur Radio Clubs, is again directing this year's party. The same station may be worked on each band and each mode, mobiles in each county change. Tenn. stations may work in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for Tenn.; state, province, or country for others.

Scoring: CW contacts are worth 1.5 points; phone contacts 1 point.

Tenn. multiply total QSO points by sum of states (50) + VE Districts (7) + Tenn. counties (95) worked. (DX contacts count for QSO points only.)

Out-of-state stations multiply total QSO points by sum of Tenn. counties worked (maximum of 95).

Mobile and portables can add 500 bonus points to their final score for each county operation outside their own county (minimum of 10 QSOs per county).

Frequencies: CW—1815 kHz and 50 kHz up from bottom of each band. Phone—1860, 3980, 7280, 14280, 21380, 28580. Novice—3725, 7125, 21125, 28125 (minimum of 10 mins. on each band or mode change).

Awards: First-place certificate to three Tenn. categories—Phone, CW, and Novice—and each state, Canada, DX, and out-of-state Novice. Four plaques go to the top Tenn. home station, mobile, portable, and out-of-state station. Entries submitting logs with at least 25 contacts will also be rewarded.

Use a separate log for each band and a dupe check sheet if you make over 100 contacts per band and mode. You can submit logs for each mode only or combine phone and c.w.

Include a large SASE with your entry and mail before May 1st to: Oak Ridge ARC, Att.: Mel Wardell, W4PJ, P.O. Box 489, Oak Ridge, TN 37831/0489.

(Received too late for the March issue, but included here for stateside readers, where CQ is usually received before the above date of this event.—ed.)

GARTG SSTV Contest

0000–0800 & 1600–2400Z Sat., April 5
0800–1600Z Sun., April 6

This is the seventh worldwide SSTV contest sponsored by the German Amateur Radio Teleprinter Group. Use all bands, 3.5–28 MHz, in that portion of the bands used for SSTV. Exchange must be made in the SSTV mode exclusively.

Exchange: Callsign, RST, and message number. GARTG members will include their 5-figure membership number. Add 50 bonus points for each member worked.

Scoring: Ten points for each contact.

Multiplier: Each country of the ARRL and WAE list. Each district in JA, PY, VE/VO, VK, W/K will be considered as a separate multiplier. The same continent and countries are only valid once on each band.

Final Score: Total QSO points × countries × continents worked plus bonus points.

There is an SWL section with scoring same as above.

The full report, sent and received, by the station logged must be shown.

Awards: A year's subscription to *RTTY*, the official organ of the GARTG, to the three top scorers in each group.

Use a separate log sheet for each band and a summary sheet showing the scoring, etc. Logs must be received no later than two months after the end of the contest. They go to: Wolfgang Punjer, DL8VX, P.O. Box 90 11 30, D-2100 Hamburg 90, Federal Rep. of Germany.

Connecticut QSO Party

2000Z Sat. to 0500Z Sun., April 5–6
1200Z Sun. to 2000Z Sun., April 6
Rest Period: 0500Z to 1200Z

The Candlewood ARA is again spon-

Calendar of Events

	Mar.	22-23	Tennessee QSO Party
*	**Mar.**	**29-30**	**CQ WW WPX SSB Contest**
	Apr.	5-6	GARTG SSTV Contest
	Apr.	5-6	Connecticut QSO Party
	Apr.	9-10	DX-YL to N.A.-YL CW
	Apr.	12-13	IBM QSO Party
	Apr.	12-13	North American QSO Party
	Apr.	16-17	DX-YL to N.A.-YL SSB
	Apr.	19-20	ARCI QRP Spring CW
	Apr.	26-27	Swiss Helvetia Contest
	May	3-4	County Hunters SSB Contest
	May	3-4	"Armadillo Run"
	May	3-4	Florida QSO Party
	May	4	DARC "Corona" 10M RTTY
	May	10-11	USSR "CQ-M" Contest
	May	10-11	New York State QSO Party
	May	17-18	ARI International Contest
	May	17-18	Michigan QSO Party
	May	**24-25**	**CQ WW WPX CW Contest**
	May	27-28	CLARA AC/DC "Mystery"
	My 31	-Jun 1	National 6 Meter Contest
	June	7-8	ARRL VHF QSO Party
	June	28-29	ARRL Field Day
	July	12-13	IARU Radiosport
	July	**19-20**	**CQ VHF WPX Contest**

* *See January CQ.*

14 Sherwood Road, Stamford, CT 06905

ASTRON CORPORATION

9 Autry
Irvine, CA 92718
(714) 458-7277

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Eastcom Industries, Ltd.
4511 Chesswood Dr.
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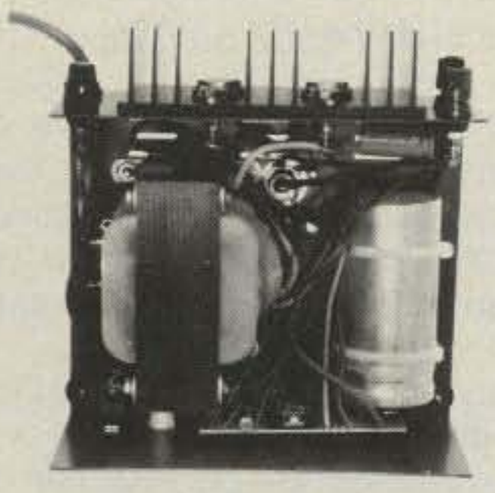

INSIDE VIEW – RS-12A

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

RS and VS SERIES

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output.
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- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105 - 125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

MODEL RM-35A

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

- Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

soring this year's party. Rules the same as those used in previous years, but with a change in operating times.

The same station may be worked on each band and each mode for QSO points. DX stations count for QSO points, but for only one multiplier.

Exchange: RS(T), QSO number, and QTH. County for CT stations, ARRL section for others.

Scoring: One point per contact, 2 points if it's with a Novice, 3 points for Oscar contacts, and 5 points if you work W1QI, the club station.

CT stations multiply total QSO points by ARRL sections, plus one DX station worked for their final score. Others use CT counties worked for their multiplier (maximum of 8).

Frequencies: CW—40 kHz up from bottom of each band. SSB—3927, 7250, 14295, 21370, 28540. Novice: 3725, 7125, 21125, 28125.

Awards: Certificates to the highest scorer in each state. A "Worked All Connecticut" certificate to those working all counties.

Mailing deadline for all entries is April 30th to: Candlewood ARA, Att: R. Dillon, N2EFA, RFD #7, Noel Court, Brewster, NY 10509. Include a large SASE for a copy of the results.

DX-YL to N.A.-YL Contest

CW: April 9–10 SSB: April 16–17
1800Z Wednesday to 1800Z Thursday

This is strictly a YL affair in which DX YL's will be contacting YL's on the North American continent. (KH6 and KL7 are considered DX.)

All bands may be used. However, cross-band, Nets, repeaters, or contacts with OM's do not count. The same station may be worked on each band and mode for QSO credit. Phone and CW are separate contests and require separate logs.

Exchange: QSO no., RS(T), and state province, or country.

Scoring: One point per contact. Your multiplier is determined by the number of states, VE provinces, and DX countries worked. Counted once only, not once on each band.

There is a power multiplier of 1.25 for stations using 150 watts or less on CW, 300 watts PEP on SSB.

Final Score: Total QSO points times (states + provinces + countries) × power multiplier if any.

There is a penalty for each duplicate contact removed from the log by the Contest Committee of three additional and equal contacts.

Frequencies: CW—3555, 7055, 14055, 21195, 28195. SSB—3955, 7255, 14295, 21395, 28595 (plus or minus 15 kHz).

Awards: Four Cups will be awarded to the 1st place winners, DX and N.A., on both phone and CW. And two Plaques to the highest combined CW/phone scores for DX and N.A. Certificates to the 2nd and 3rd place DX and N.A. winners.

Submit separate logs for each contest. Include a summary sheet showing the scoring, transmitter power, and other essential information. The usual signed declaration is also requested.

Entries must be postmarked no later than May 5th and received no later than May 28th. This year they go to: Mary Lou Brown, NM7N, 504 Channel View Dr., Anacortes, WA 98221.

1985 Results

CW Winners

NA		DX
WD4NKP	Gold Cup	CT1YN
VE1BWP	2nd Place	I2KYM
WD8MEV	3rd Place	VK3KS

SSB Winners

WD4NKP	Gold Cup	DJ0EK
WD5FQX	2nd Place	IO2KYM
KM8E	3rd Place	GM4YMM

CW and SSB

WD4NKP	I2KYM

IBM QSO Party

0000Z Sat. to 2400Z Sun., April 12–13

This contest is open to present, retired, and immediate family member employees of the IBM Corp. Competition is worldwide, but for single operator stations only. The same station may be worked on each band and mode for QSO credit. Competing stations will call "CQ IBM."

Exchange: RS(T), QSO no. and IBM division, and location. (Retirees use "retired" for their division.)

Scoring: One point per QSO with same country, 3 points with another country in same continent, 5 points with another continent.

Multiplier: Determined by number of different countries and USA areas worked. US is divided into 4 areas: (1) W1, W2, W3. (2) W4, W5. (3) W6, W7. (4) W8, W9, W0.

Frequencies: CW—3560, 7030, 14060, 21060, 28060, SSB—3760, 3892, 7060, 7260, 14260, 21310, 28560, plus or minus 10 kHz.

Awards: Diplomas to first three winners in each category and area. Plaques to first-place winners in each category and area. A super plaque to the overall top scorer. Special QSL card to all who submit a log. (Three categories: CW, SSB, and Mixed. Three areas: USA, Europe, and other overseas areas.)

Mailing deadline is May 15th. North American entries go to: Roger R. Root, KC7LZ, 6851 N. Skyway Drive, Tucson, AZ 85718. All other countries' entries go to: J. Motte, F6HMJ, 1185 Route de La Colle, 06570 Saint-Paul, France. It is recommended that you write to one of these people for more detailed rules.

North American QSO Party

1800Z Sat. to 0600Z Sun., April 12–13

To fill the void caused by the ARRL dropping its annual QSO Party, the National Contest Journal is promoting this activity. The initial plans are for a CW party with an SSB mode later if interest warrants.

Activity will be on all bands, 10 through 160, single operator only.

The exchange will be your name and QTH; state, province or country.

Scoring, total QSOs times the sum of U.S. states, VE provinces, and N.A. countries worked on each band.

Any station may be worked for QSO point credit but only North American stations have multiplier credit.

Other details are rather skimpy at this writing. As a matter of fact, I don't even know where you should send your logs. Hope to have that information and more details next month.

ARCI QRP Spring CW Contest

1200Z Sat. to 2400Z Sun., Apr. 19–20

Participation is open to members and nonmembers. Operating time is limited to 24 hours out of the 36-hour period. The same station may be worked on each band for QSO and multiplier credit.

Exchange: RST and state, province, or country. Members will include their QRP number; non-members their power.

Scoring: Contacts with a member 5 points, with a nonmember in the same continent 2 points, but 4 points if on a different continent.

There is a power multiplier as follows:
4 to 5 watts output—×2
3 to 4 watts output—×4
2 to 3 watts output—×6
1 to 2 watts output—×8
Less than 1 watt out—×10
Over 5 watts output—check log.

There is a bonus multiplier of ×2 for stations using solar or wind power. And ×1.5 if using battery.

Final Score: Total QSO points × (states + provinces + countries) worked on each band, × power multiplier × bonus multiplier if any.

Frequencies: 1810, 3560, 7040, 14060, 21060, 28060, 50360. Novice: 3710, 7110, 21110, 28110.

Awards: Certificates to the highest scorers in each state, province, and country with two or more entries. Scores will be credited for the annual "Triple Crown" QRP award. Also a special certificate from Adrian Weiss, W0RSP, to stations using less than 1 watt.

Use a separate log sheet for each

band and a summary sheet showing the scoring and other essential information. Scoring sheets are available from KA5NLY. Include a large SASE with your request. Include an SASE if you desire results of contest.

Logs must be received no later than a month after the end of the contest and go to: QRP ARCI Contest Chairman, Eugene Smith, KA5NLY, P.O. Box 55010, Little Rock, AR 72225.

Swiss Helvetia Contest

1300Z Sat. to 1300Z Sun., Apr. 26–27

The Swiss usually try to activate some of the rare Cantons, so this offers a good opportunity to build up your totals for the attractive Helvetia Award. Confirmation of all 26 Cantons is required. Only contacts made after January 1, 1979 are valid.

All bands may be used, 1.8–28 MHz, phone or CW (but not the new WARC bands). The same station may be worked on each band for QSO and multiplier credit, but only on one mode, either phone or CW.

Exchange: RS(T) plus a three-figure QSO number. Swiss stations will also include two letters identifying their Canton. Abbreviations of the Cantons are as follows: AG, AI, AR, BE, BL, BS, FR, GE, GL, GR, JU, LU, NE, NW, OW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each HB contact is worth 3 points. The sum of Cantons worked on each band is your multiplier (a possible total of 26 on each band).

Final Score: Total QSO points multiplied by the sum of Cantons worked on each band.

Awards: Certificates to the top scorers in each country and each USA and Canadian call area.

Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicate contacts and include a summary sheet showing the scoring and your name and address in block letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, Walter Schmutz, Gantrischweg 1, CH-3114 Oberwichtrach, Switzerland.

Applications in the form of QSL cards for the Helvetia Award go to: Max Bindschedler, HB9MX, Strahleggweg 28, CH-8400 Winterthur, Switzerland.

Only five entries were received from North America last year, probably due to very poor propagation: VE1AIH 2184 points, VO1AW 960, KA2DYB 105, W4YN 90, and WA3JXW 3.

Florida QSO Party

May 3, 1400Z–1900Z Saturday
May 4, 0001–0500 & 1500–2300 Sunday

This is the 20th annual QSO Party sponsored by *Florida Skip*. The same station may be worked on each band and on each mode. Phone and CW are separate contests and require separate logs. FL stations may work other FL stations, but for QSO points only.

Fla. stations are divided into two classes. Class A—Portables and mobiles operating outside own county using emergency power of 100 watts or less output. Class B—All other single and multi-operator stations.

Exchange: RS(T) and QTH. County for FL; state, VE province, or country for others.

Scoring: *For Florida*—One point per QSO. Multiply total by sum of states (49), VE provinces (12), and DX countries (maximum of 27) worked (maximum multiplier of 88). Class A stations multiply total score by 1.5 factor.

Out-of-state—Two points for each FL contact. Multiply total by FL counties worked (maximum of 67).

Frequencies: CW—3555, 7055, 14055, 21055, 28055. SSB—3945, 7279, 14279, 21379, 28579. (Also 160 and 2 meters.)

Awards: Certificates, both phone and CW, to the top single operator score in each state, province, and DX country, and each FL county. There are five plaques as follows: to the top single operator in FL and out-of-state, both on CW and SSB, and to the FL club with the highest aggregate score.

There is the usual disqualification clause for taking credit for excessive duplicate contacts and multipliers and other infractions.

Include a summary sheet showing the scoring and all essential information, include a dupe sheet for entries with 200 or

more contacts, and the usual signed declaration.

A large SASE will get you sample log forms. Mailing deadline for all entries is June 6th to: Florida Skip Contest Committee, c/o North Florida ARA, P.O. Box 9673, Jacksonville, FL 32208.

County Hunters SSB Contest

0001Z Sat. to 2400Z Sun., May 3–4
(Off: 0800 to 1200 each day)

This is the 15th annual contest sponsored by the Mobile Amateur Radio Awards Club to increase activity for the County Awards program. The two four-hour rest periods are mandatory.

Emphasis is on mobile operation. Fixed stations may work other fixed stations, but only once regardless of the band. Mobiles may be worked from each county or band change. Mobiles contacted on a county line count as one QSO but two multipliers. QSOs made on a Net frequency do not count.

Exchange: Signal report, county, and state; country for DX stations. (Mixed-mode contacts are permitted providing one station is on SSB.)

Points: Contacts with a fixed W/K, 1 point (including KH6/KL7). W/K contacts with VEs, 3 points. W/K contacts with DX, 5 points. Contacts with U.S. mobiles, 15 points. Contacts with U.S. mobile team, 30 points (both ops. participating).

1985 All Asian Phone Contest
North America Results

U.S.A.

3.5 MHz

N6RO	**2,964**

7. MHz

K6NA	**36,281**

14 MHz

W6SZN	**19,251**
KM1R	**15,330**
K3ZJ/4	**14,579**
WA6VNR	12,702
W6BH	12,213
K1RM	11,605
K9ZO	**9,964**
NB2P	**9,918**
NN7L	**5,504**
W6OK	4,940
W8EX	**3,654**
W9MP	3,280
NG2X	2,871
W3BGN	**2,160**
WA8YTM	2,160
WA7KLK	1,856
N4MM	1,768
WA3DMH	1,232
KR1R	1,000
W1QV	588
KW2J	513
KA7FEF	192

28 MHz

K7SS	**1,971**

All Band

K6EID	**41,076**
K3ZO	**34,542**
W9SE	**25,317**
W7ND	**24,786**
WD8IXE	**12,240**
K1KI	**9,499**
W2FCR	**6,579**
WA6FGV	2,970
KA2BBZ	2,788

14 MHz

Dom. Rep.

HI8A	**4,840**

Canada

VE3XN	**10,388**
VE2AEJ/3	374
VE1CBF	210

Costa Rica

TI2CCC	**1,104**

Multi-Opr.
U.S.A.

NR5M	**151,076**
KM7U	212

United Nations

4U1UN	**1,767**

Certificate winners are in boldface.

Final Score: Total QSO points times total number of U.S. counties worked.

Frequencies: 3870–3890, 7225–7250, 14250–14285, 21360–21380, 28570–28600. Following spots considered "Mobile Windows": 3875, 7240, 14270 (plus or minus 5 kHz). Fixed stations must QSY after working a mobile.

Awards: Plaques to the first- and second-place U.S. mobile, top-scoring fixed U.S./Canadian, DX station, and Mobile Team. Certificates to the top 10 mobiles, and to the top scorers in each state, province, and DX stations.

It is suggested that you send a large SASE to WA5DTK for detailed rules and log forms. All entries must be received by June 4th and go to: Barry Brewer, WA5DTK, P.O. Box 65, Randolph AFB, TX 78148. Winners will be announced at the County Hunters Convention and in the MARAC Newsletter. (Include a large SASE for copy.)

Armadillo Run

SSB: May 3–4 CW: July 26–27
0000Z Saturday to 2359Z Sunday
(Rest Period 0800 to 1200Z)

The Texas DX Society is again sponsoring this popular activity. This year's "Run" is in commemoration of the Texas Sesquicentennial (150th year of statehood).

This promises to be the real "big" one, as their goal is to activate all 3076 U.S. counties, plus a newly created Armadillo County. The new county will be recognized from March 2 to December 31, not only for the two weekends of the run, but also available for the CQ USA-CA awards program.

You will note that the dates and times are the same as for the County Hunters' contests. The exchange and other features are also the same. Therefore, check the County Hunters announcement in this issue for the SSB weekend and the July issue for the CW.

There will be special Armadillo Run stations on between 1300 and 0100Z Saturday and Sunday activating their assigned counties on 20 and 40 meters.

Scoring is the same as the CHC contests with the following additions. Australian counties will also count as multipliers. Armadillo County, Texas counts 5 times QSO points. Armadillo County, South Australia counts 10 times QSO points. And any VK5 station counts 5 times QSO points. (Since 1986 is also the 150th anniversary for South Australia, they plan to run joint activities with the Texas Armadillo Run.)

There will be awards galore, more than can be covered in this edited announcement. I strongly advise you to send a large SASE to Tom Taormina, K5RC, 12610 Barbizon, Houston, TX 77089 for a copy of the *Armadillo Press* with all the details and a list of Regional Coordinators.

Logs go to: The Texas DX Society, 350 Magnolia Bend, New Caney, TX 77357 and must be received within one month after the contest date.

DARC "Corona" 10 Meter RTTY

1100Z to 1700Z Sun., May 4

This is the second of a series of four 10 Meter RTTY contests sponsored by DARC for 1986. The remaining two will take place September 6th, and November 2nd. Activity, of course, is on 10 meters only in that portion of the band used for RTTY.

Classes: Single operator, multi-operator, and SWL.

Exchange: RST, QSO no., and name. U.S. stations will also include their state.

Scoring: One point per QSO. Use the WAE and ARRL country list for your multiplier. In addition, U.S. states, VE/VO, and VK call areas will be considered as separate multipliers. (See Aug. *CQ* for WAE list.)

Final Score: Total QSO points times the country and call area multiplier.

Awards: To leading station in each classification.

It is recommended that you use official log forms, which can be obtained from DE8BUS. Include an SASE with your request. You can also make up your own and include a summary sheet with detailed information.

Entries should be received within 30 days after the end of the contest and go to: Heinz Moestl, DE8BUS, P.O. Box 1123, D-6473 Gedern 1, West Germany.

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ICOM: IC2AT, ICO2AT, IC-04AT, IC-A2/U16

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Wilson Maxon
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine) M700
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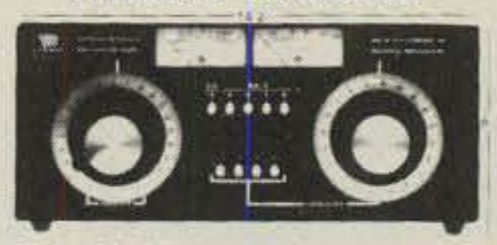

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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The Royal Observatory of Belgium has published the provisional monthly sunspot numbers for 1985. The following are the reported *monthly mean* numbers:

1985

Jan. 16.5	July 30.8
Feb. 16.1	Aug. 10.4
Mar. 11.9	Sept. 3.9
Apr. 16.1	Oct. 18.5
May 27.4	Nov. 16.6
June 24.2	Dec. 17.2

The *yearly mean* was 17.5. This is the lowest level of yearly mean solar activity observed since 1977.

The monthly mean values observed during 1985 result in the following *12-month running smoothed sunspot numbers*, upon which Cycle 21 is based.

1984	1985
July 44	Jan. 21
Aug. 40	Feb. 20
Sept. 34	Mar. 19
Oct. 29	Apr. 18
Nov. 25	May 18
Dec. 22	June 18

Cycle 21 continues to decline much as predicted in the December Propagation column (see page 114). A smoothed sunspot number of approximately 9 is forecast for April 1986. It still looks as if the end of the present cycle will occur sometime during late 1986.

April DX Propagation

During April *20* meters should be the optimum band for DX propagation conditions during most of the daylight hours, and into the early evening hours as well. Somewhat fewer openings are expected on *15* meters compared to the winter months, but some fairly good DX still should be possible towards southern and tropical areas, especially during the afternoon hours when conditions are High Normal or better. Few *10* meter DX openings are expected this month, but an occasional one should be possible from all USA time zones towards South America, and from the western states towards the South Pacific. Be sure to check this band during the afternoon hours and when conditions are High Normal or better.

For a few hours *after* sunset, optimum DX propagation conditions should be shared between *20* and *40* meters. Good openings to many parts of the world are forecast for both bands between sunset and midnight, and on *40* meters from midnight to sunrise. Some good DX openings should also be possible on *80* meters during the hours of darkness and at sunrise. There is also a good chance for some *160* meter DX openings during this same time period.

Seasonably favorable propagation conditions over long paths between the northern and southern hemispheres—for example, to Australasia, South America, southern Africa, etc.—should continue during April on all HF bands.

Thunderstorm activity increases during April in the northern hemisphere, and this should result in increased levels of static on all HF bands, especially *40*, *80*, and *160* meters.

Short-Skip Propagation

For openings between 50 and 250 miles, use *80* meters during the day and *160* meters at night. Between 250 and 750 miles, use *40* meters during the day, *80* meters at sunrise and sunset, and *160* meters during the hours of darkness. For openings between 750 and the short-skip limit of 2300 miles, use *20* meters during the day, *40* meters at sunset and sunrise, and *80* meters during the night. Expect an increase in short-skip openings on *15* and *10* meters between distances of about 500 and 1300 miles during the daylight hours,

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1986

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 9, 21, 29	**A**	**A**	**B**	**C**
High Normal: 2, 20, 22-23, 27-28	**A**	**B**	**C**	**C-D**
Low Normal: 1, 3-4, 8, 10, 12-13, 17-19, 25-26, 30	**A-B**	**B-C**	**C-D**	**D-E**
Below Normal: 5, 7, 11, 14, 16, 24	**B-C**	**C-D**	**D-E**	**E**
Disturbed: 6, 15	**C-E**	**D-E**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on the 1st, good (B) on the 2nd, good-to-fair (B-C) on the 3rd and 4th, fair-to-poor (C-D) on the 5th, etc.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not GMT*. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

April 15 - June 15, 1986
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	12-17 (1)	05-07 (1) 07-10 (2) 10-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-03 (2) 03-04 (1)	20-22 (1) 22-01 (3) 01-02 (2) 02-03 (1) 22-00 (1)* 00-02 (2)* 02-03 (1)*
Northern Europe & European USSR	11-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (1)	19-20 (1) 20-23 (2) 23-01 (1)	20-00 (1)
Eastern Mediterranean & Middle East	14-16 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-19 (1) 22-00 (1)	19-21 (1) 21-23 (2) 23-00 (1)	21-23 (1)
Western Africa	12-14 (1)** 10-12 (1) 12-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	20-22 (1) 22-02 (2) 02-03 (1)	00-02 (1)
Eastern & Central Africa	10-13 (1) 13-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	21-01 (1)	22-00 (1)
Southern Africa	12-14 (2) 14-15 (1)	16-17 (2) 17-18 (3) 18-20 (1) 23-01 (1)	22-00 (2) 00-02 (1)	
Central & South Asia	17-19 (1)	07-10 (1) 14-16 (1) 19-21 (1)	05-07 (1) 19-21 (1)	*Nil*

South-east Asia	*Nil*	08-10 (1) 18-20 (1)	*Nil*	*Nil*
Far East	17-19 (1)	08-10 (1) 18-19 (1) 19-21 (2) 21-23 (1)	04-06 (1)	*Nil*
South Pacific & New Zealand	15-18 (1)** 09-11 (1) 15-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (1) 20-23 (2) 23-02 (1)	02-03 (1) 03-04 (2) 04-06 (3) 06-07 (1)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
Austral-asia	17-20 (1)	07-08 (1) 08-10 (2) 10-11 (1) 15-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (1)	03-05 (1) 05-07 (2) 07-08 (1)	04-07 (1) 04-06 (1)*
Carib-bean, Central America & North-ern Countries of South America	11-14 (1)** 14-16 (2)** 16-17 (1)** 10-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	04-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1)	21-02 (1) 02-05 (2) 05-07 (1) 03-06 (1)*
Peru, Boliva, Para-guay, Brazil, Chile, Argen-tina & Uruguay	12-15 (1)** 15-16 (2)** 16-17 (1)** 08-09 (1) 09-11 (2) 11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	20-21 (1) 21-04 (2) 04-06 (1)	23-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
McMurdo Sound, Antarc-tica	*Nil*	07-08 (1) 08-09 (2) 09-10 (1) 16-20 (1) 20-23 (2) 23-00 (1)	01-05 (1)	*Nil*

April 15 - June 15, 1986
Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	14-16 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	19-21 (1) 21-23 (2) 23-01 (1)	21-00 (1)
Northern Europe & Euro-pean USSR	*Nil*	07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 20-22 (1)	20-20 (1)	21-22 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-09 (1) 13-15 (1) 15-17 (2) 17-18 (1) 22-00 (1)	20-00 (1)	*Nil*
Western Africa	12-14 (1) 14-15 (2) 15-16 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	20-01 (1)	*Nil*
Eastern & Central Africa	13-15 (1)	07-09 (1) 13-16 (1) 16-19 (2) 18-19 (1)	21-00 (1)	*Nil*
South-ern Africa	09-11 (1) 11-13 (2) 13-14 (1)	14-16 (1) 16-18 (2) 18-21 (1)	20-22 (1) 22-00 (2) 00-01 (1)	22-00 (1)
Central & South Asia	17-19 (1)	08-10 (1) 17-19 (1) 19-21 (2) 21-22 (1)	05-07 (1) 19-21 (1)	*Nil*
South-east Asia	*Nil*	08-10 (1) 19-22 (1)	05-07 (1)	*Nil*
Far East	18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-23 (1)	03-05 (1) 05-06 (2) 06-07 (1)	05-06 (1)
South Pacific & New Zealand	15-17 (1)** 11-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	16-19 (1) 19-21 (2) 21-23 (3) 23-03 (2) 03-07 (1) 07-08 (2)	00-02 (1) 02-04 (2) 04-05 (3) 05-06 (2) 06-07 (1)	02-04 (1) 04-05 (2) 05-06 (1) 04-05 (1)*
		08-10 (3) 10-11 (2) 11-13 (1)		
Austral-asia	16-18 (1) 18-20 (2) 20-21 (1)	06-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-00 (2) 00-02 (1)	02-04 (1) 04-06 (2) 06-07 (1)	04-06 (1)
Carib-bean, Central America & North-ern Countries of South America	11-13 (1)** 13-16 (2)** 16-17 (1)** 09-11 (1) 11-12 (2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	00-07 (1) 07-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	19-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1)	21-23 (1) 23-04 (2) 04-06 (1) 00-05 (1)*
Peru, Bolivia, Para-guay, Brazil, Chile, Argen-tina & Uruguay	12-15 (1)** 15-16 (2)** 16-17 (1)** 08-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-08 (1) 08-09 (2) 09-10 (3) 10-16 (1) 16-18 (2) 18-19 (3) 19-20 (4) 20-21 (3) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	21-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-05 (1)	00-04 (1) 01-03 (1)*
McMurdo Sound, Antarc-tica	15-17 (1)	08-10 (1) 16-18 (1) 18-22 (2) 22-00 (1)	00-06 (1)	*Nil*

April 15 - June 15, 1986
Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & South-ern Europe & North Africa	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-18 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1)	21-23 (1)
Central & North-ern Europe & Euro-pean USSR	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-23 (1)	21-22 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-10 (1) 10-12 (2) 12-13 (1) 22-00 (1)	20-23 (1)	*Nil*
Western Africa	10-14 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (1)	20-23 (1)	*Nil*
Eastern & Central Africa	10-12 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-17 (1)	20-22 (1)	*Nil*
South-ern Africa	10-13 (1)	07-09 (1) 13-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	19-22 (1)	20-22 (1)
Central & South Asia	19-21 (1)	08-09 (1) 09-11 (2) 11-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)	*Nil*
South-east Asia	19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 21-22 (1) 22-23 (2) 23-01 (1)	04-07 (1)	05-06 (1)
Far East	19-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 18-21 (1) 21-23 (2) 23-01 (1)	02-03 (1) 03-06 (2) 06-08 (1)	03-07 (1)
South Pacific & New Zealand	15-18 (1)** 11-13 (1) 13-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	06-08 (1) 08-11 (2) 11-17 (1) 17-20 (2) 20-21 (3) 21-23 (4) 23-00 (3) 00-02 (2) 02-04 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1)	01-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)*
Austral-asia	16-18 (1)** 13-16 (1) 16-17 (2) 17-19 (3)	06-08 (1) 08-10 (2) 10-12 (1) 18-20 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
	19-20 (2) 20-22 (1)	20-22 (2) 22-02 (3) 02-03 (2) 03-04 (1)	07-08 (1)	
Carib-bean, Central America & North-ern Countries of South America	11-14 (1)** 14-16 (2)** 16-17 (1)** 09-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	00-06 (1) 06-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-00 (2)	19-20 (1) 20-21 (2) 21-02 (3) 02-04 (2) 04-06 (1)	21-00 (1) 00-03 (2) 03-05 (1)* 01-04 (1)*
Peru, Bolivia, Para-guay, Brazil, Chile, Argen-tina & Uruguay	13-16 (1)** 09-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (1) 08-10 (2) 10-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-01 (1)	20-22 (1) 22-02 (2) 02-04 (1)	21-03 (1) 00-03 (1)*
McMurdo Sound, Antarc-tica	16-19 (1)	07-09 (1) 16-18 (1) 16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1)	03-06 (1)	*Nil*

*Indicates best time for 160 meter opening.
**Indicates best time for 10 meter opening.

but these will occur sporadically. There is also the possibility for openings on *15* meters during the afternoon hours between distances of approximately 1300 and 2300 miles. Check the *CQ* Short-Skip Propagation Chart which appeared in last month's column for more details.

DX propagation predictions for each amateur band between *10* and *160* meters for the period April 15 through June 15, 1986 appear in the DX Charts with the column. Beginning this month and continuing through the summer and fall, the times shown in the Propagation Charts will be local *daylight* time (EDT, CDT, MDT, and PDT).

Check the day-by-day *general* propagation forecast for April, which appears in the Last Minute Forecast at the beginning of this column.

VHF Ionospheric Openings

Chances for some unusual VHF ionospheric openings during April look pretty good.

Some auroral-type openings should be possible during periods of radio storminess. Check the Last Minute Forecast at the beginning of this column for those days during April that are expected to be Below Normal or Disturbed.

Lyrids, a major meteor shower, is due April 22–24. It will probably peak late April 22 or early on the 23rd, with an average of about 15 good-size meteors entering the earth's atmosphere every hour. This should considerably increase chances for VHF meteor-scatter-type openings.

Sporadic-*E* propagation usually begins to increase during April, and it should continue to do so through the spring and summer months. Look for an increase in short-skip openings on both the *10* and *6* meter bands during the month. Most openings on *10* meters should fall between approximately 750 and 1300 miles. Sporadic-*E* openings, as the name infers, may occur at any time of the day or night, but there is a tendency for them to peak between 8 a.m. and noon and again between 5 and 9 p.m., local time.

73, George, W3ASK

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

VEC's—The Testing Link Between the FCC and the Amateur

While many amateur radio operators seemed to be more than a little surprised when the FCC announced that 1984 would be the last year that they would administer amateur radio operator examinations to the public, the truth is that the Commission had been planning this move for many years. The signs were all there.

Reductions in federal budgets and manpower were the rule in the late 1970s and early 1980s. The Reagan administration set in motion a plan to get "big government" off the back of the average citizen. A trend developed that saw many agencies turning over to the private sector activities that previously had been accomplished by the government.

In 1980 the FCC began abolishing most of its commercial radiotelephone licensing program. They eventually turned technician certification over to industry groups. Couple this information together with the availability of Dick Bash's *Final Exam* manual that listed the exact questions and answers to all of the FCC amateur exams, and it became crystal clear to us that it wouldn't be long before the amateur community would be determining who would be gaining access to the amateur bands.

The volunteer testing program wheels were set in motion in 1981 when legislation was planned to legally allow the public to voluntarily assist the government. It was brought out by William E. Dannemeyer (R-California) that even though the Novice amateur radio operator examination had been given by volunteers for decades, this was actually illegal, since government rules forbid volunteer help from the private sector.

Barry Goldwater, K7UGA, politically the nation's highest ranking amateur operator, suggested that *all* amateur radio examinations—not just the Novice test—could be prepared and administered by volunteers. He said such a move would save U.S. taxpayers some $400,000 a year! His proposal permitting volunteer amateur radio testing and monitoring was tagged to the Communications Technical Amendments Act of 1982. Public Law 97-259 was signed into law by President Reagan on September 13, 1982, and with it came an amendment authorizing legal volunteer amateur radio operator testing.

Implementing Volunteer Testing

The burden of developing a way to implement the volunteer plan fell to John Johnston, W3BE, in charge of the FCC's Personal Radio Branch and Ray Kowalski, the FCC's Special Services Division chief. They did a marvelous job.

The plan was to develop a set of questions for each amateur radio class and then select a certain amount from each sub-section for test administration by VE's. The topics for each license class's questions were outlined in the PR-1035 study guide. Amateurs were asked to help the FCC develop these pools of questions. A decision was made to come up with ten times as many questions as would be needed for any one amateur radio operator examination.

Thus, 1600 questions were chosen by the FCC—200 for the Novice, 500 each for the Technician/General and Advanced, and 400 for the Extra class written examination. Most were submitted by the Dayton Amateur Radio Association and the ARRL. The Dayton group was particularly concerned because it appeared that they might not have amateur tests at their 1984 Hamvention. The availability of amateur tests is a big draw at Dayton, and the job was completed in time for them to have their 1984 tests!

The pools of written test questions were released to the public in various Private Radio Bureau releases called PR Bulletins in late 1983 and 1984: PR-1035A for the Novice class, PR-1035B Technician/General, PR-1035C Advanced, and PR-1035D Extra class. Even though the Novice class examination is not really a part of the newer Technician through Extra class program, the FCC elected to extend the written test pool question system to that class also. This meant that the amateur community would be able to completely prepare and administer all classes. Prior to 1984 the FCC prepared and received all Novice written examinations even though they were administered by volunteer examiners.

Volunteer Testing Gets Underway

Once the question pool and system were in place, the FCC adopted a Report and Order implementing volunteer testing. Even though the ARRL clearly wanted to control *all* amateur testing (their comments said only a single national nonprofit organization should be appointed as amateur radio operator test administrator) the FCC elected to go with a system of regional text contacts called Volunteer Examiner Coordinators. These VEC's would act as an intermediary between the government and the volunteer examiners. Their job would be primarily to recruit VE's, provide them with testing materials, and screen and forward the successful upgrade applications (FCC Form 610's) to the FCC in Gettysburg, Pennsylvania for license issuance.

Amateurs everywhere thought that the American Radio Relay League would immediately apply to be a VEC in all regions, but they didn't. Instead the League said that they needed a provision for test session out-of-pocket expense recoupment. This was not provided for by the initial legislation.

The last year of FCC testing was half over when we applied to be a VEC in all regions. We thought long and hard before we submitted our proposal to be a Volunteer Examiner Coordinator. Our feeling was that the ARRL should have taken on the coordination duty immediately while awaiting legislation authorizing expense recoupment. They chose not to. The W5YI-VEC program was the first to be approved for all regions, and we immediately set about recruiting volunteer examiners to administer tests.

We were prepared to press on with our program even if expense recoupment was not approved. A program was set up which shifts some of the expenses to the VE team, feeling that small test sessions couldn't cost too much and many VE's would be willing to assume this expense. Today we share expense reimbursement with our VE's and believe we are the only VEC that does so. We also planned (but never had to follow through on) a campaign to promote more VEC's who would follow our program and accredit their own VE's. One way or another, we were going to have amateur testing!

We Became a VEC in All Areas

Test creation in the early days of the VE program was a problem. We only had a list of questions—*no answers!* The FCC had done an excellent job of developing the questions, and even though they had the answers to all of them, they chose not to release them! To this day I am not sure why. My guess is that they did not want to be challenged as to whether or not the answer was correct. We solved the answer problem by filing a Freedom of Information Act request for the answers to obtain them. Only certain information is exempted from release under FOIA rules, and the amateur test answers were not so protected.

Private Radio Bureau Chief Bob Foosaner wrote us a letter (as required by FOIA

P.O. Box #10101, Dallas, TX 75207

rules) telling us in which room and file cabinet the answers were kept. He said that they would be made available to us. We sent in an independent FCC press service to photocopy them. It cost us several hundred dollars! The pool questions were one to a sheet of paper, and thus I ended up with 1600 photocopies. I rephotocopied them and sent them to every known license preparation publisher I could think of: Gordon West, WB6NOA; Marty Schwartz, KL2LO, of AMECO; and Dick Bash, KL7IHP, among them. It was my first attempt to try to standardize answers! I offered to send the ARRL a set of the answers, but they refused them! I guess they already had them.

Once we had the answers, ten different versions of each of the tests were developed. One of our initial test sets was developed by Harry W. Lewis, W7JWJ, of Seattle, one of our first VE's. Lewis is the husband of the ARRL Northwestern Division Director, Mary E. Lewis, W7QGP. Harry was an *immense help* during the early days when we had little with which to work! Harry also headed up our early testing teams. While VEC's now design all tests, initially all questions to be asked were provided by the FCC. We had to prepare a test based on the questions they specified.

While our initial tests were not very good, we were able to test several hundred amateurs before the League developed what has now become a de facto multiple-choice standard. I will *never again* criticize the FCC, the League, or anyone else for their test development efforts! Anyone who thinks he can improve on them should try his hand at it himself! It is an unbelievably difficult job to do, with many questions being raised by the answers! We totally believe in standardized multiple-choice answers—and distractors (the wrong answers)—and hope we never again have to develop our own multiple-choice answers. We are prepared to, however, if required.

The W5YI VEC Program Today

Frequently we get asked how we manage to coordinate amateur radio examinations anywhere in the world almost single-handedly. The fact of the matter is that we don't do it alone. Our "staff" amounts to just a couple of people plus paid high school students.

We have four separate operations: VE accreditation, testing material preparation, session scheduling, and test review. Everything except review of the applications is done completely (and quickly) with computers. The computers used are TRS-80 Model 4's. We have three of them, each with two disk drives. In addition, we have two hard disks and three printers, two of which are daisy wheels.

Accreditation: We use data base management software (DBMS) to handle volunteer examiner accreditation. Requests to become a VE (accompanied by the statutorily required statement and amateur radio operator license photocopy) are handled weekly. We merely key in the VE candidate's name, address, and call sign, and the computer does the rest. A new VE sequential certification number is assigned, and labels automatically are generated which are adhered to the accreditation documents—certificates, cards, address labels, etc. Each VE has a "page" in the DBMS, and this page is later recalled and an "X" placed next to the year that a VE participates in a test. It is in this manner that we know who has been active during the year.

Computer reports have been formated which generate VE lists in sequential as well as zip-code order. We use these lists to check accreditation status when tests are conducted or to advise applicants of the nearest VE or examination site by advising (via a form letter) the nearest VE zip codes. We have about 2000 volunteer examiners. Since we use high school students to help prepare all accreditation (and test) packages ahead of time, it is merely a case of slapping labels on documents and envelopes. Our whole program is based on simplicity and speed. Actually, each accreditation takes only a few seconds! We remind each new VE that it takes three accredited VE's to conduct a test session. Only Extra class amateurs are accredited, since only they can administer all examinations.

Testing Material: Once the VE lines up two

additional (and preferably more) VE's, a testing session can be held. The VE writes or telephones us of the test date and location, and a test session package (weighing over a pound) is sent to them the same day. With postage, each session package costs us about $5.00. The contents of these packages are stored in a 15 megabyte hard disk for instant recall and editing. Once edited, they are quick printed and sorted into ready-to-mail packages by high schoolers—50 at a time.

The package contains complete VE instructions. We assume that the VE knows nothing about the program. A newly updated set of instructions (16 pages) is sent every time a session is held. It takes only 30 minutes to read. Our feeling is that it should be no more difficult to conduct a Technician through Extra class test session than it is for a Novice examination. We only have four different forms; one is the FCC Form 610 application. The instructions show samples of each correctly filled out.

We send three different versions of each amateur radio operator test to be administered. The VE duplicates the tests as needed. The VE can use one version or all versions at each test session. We never know which test is being administered. Even though it may be a different program, we also include Novice tests in the package in the event they are needed. (Element 2 is a prerequisite to taking higher class examinations.)

We are constantly changing our written tests and have 30 different versions at present! Our written tests are generated from San Antonio, Texas by the Datapoint Amateur Radio Club. Steve Sternitzke, NS5I, a computer programmer for Datapoint (a large manufacturer of computers) has meticulously keyed in each of the 1600 questions and multiple-choice answers that make up the FCC's question pool. Steve has written computer software that generates random tests according to the FCC's "recipe" specifying how many questions to select from each topic.

These tests are printed by high-speed laser printers on a single 11"×17" sheet (folded in half to make four pages) to make duplication by our VE's easier. We can immediately get additional different test versions by just asking the computer to spit them out! Steve works long and hard in the background without compensation of any type. His efforts and supplies are underwritten by Datapoint. He is a truly valuable member of our team!

Session Scheduling: We fire up another computer program called "EXAM" when we get a test session request. We average one or two a day, although we have had more than ten sessions scheduled around the country for a single day. The EXAM software also generates a number of labels that are used for various letters, ledgers, envelopes, etc. Again, all we do when we get a request for an examination session is adhere labels to precollated packages. As in the case of VE accreditation, this part of the program takes practically no time once the examination packages are set up.

The ARRL (and others) are sent copies of our examination schedule so that it can be loaded into their test session data base.

Test Review: This is what takes the time! All applications and session papers must be carefully checked. It averages about an hour per session depending upon the number of applicants and how much letter writing has to be done.

We set up a file on every test session and then forward each session's successful applications and reports to the FCC in Gettysburg—usually the same day as received from the VE team. We have the fastest turnaround of any VEC. Copies of all important papers are made before forwarding in case the submission envelope is lost. We log all test results into our EXAM program so that statistics can be developed.

Developing the W5YI-VEC program has been an experience—and fun. We were the first to handle testing via mail order and continue to refine the system. When we started we had only an "idea." Suggestions from our VE's have been a big help. Over 5000 amateurs were tested by W5YI volunteer examiners during 1985. Over 3000 of them upgraded! Our program continues to grow!

Write to us for a VE application if you are an Extra class amateur and want to get involved in helping the amateur ranks grow. You'll be amazed at how easy it is! See you next month. De W5YI.

KENWOOD

...pacesetter in Amateur radio

Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/ alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.

- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz. (TR-3600A covers 440-450 MHz.)
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.

KENWOOD

TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the Month as told by Al is:

Al Garrett, KG5J
All Counties #486, 11-30-84

In January 1978 when I was first licensed as WD5IRH, I had never heard of the 'County Hunters.' My first contact with one was while I was working an OK station on CW who kept asking for my county. Thinking that the operator of the other station did not know how to spell 'country,' I answered U.S.A. He very patiently kept asking for my county, so I finally answered 'Perry,' and apparently he was satisfied.

"My next contact with County Hunting occurred while I was looking for a quick way to complete WAS on 20 meters. I sent an SASE to KC0MB for his state, and George took the time to write to advise me of the high cost of sending an SASE for each county and suggested that I use the Mobile QSL Bureau.

"Some time later Evelyn and I started taking an occasional trip. As my mother had been seriously ill, I was looking for ways to maintain contact with the family while motoring down the highways. I remembered the group on 14.336, and it seemed the best way of keeping in touch.

"One thing led to another, and I met KC4IF, Pete, while visiting Asheville, NC. Then I caught KB0TD and Wilma near my QTH and had a short visit with them. We attended the County Hunters' conventions at Saline, Long View, Kansas City, and Manchester. I started collecting and putting out counties, and I was soon completely hooked on County Hunting.

"At first I thought I would pursue some other activity after I finished All Counties, but after becoming acquainted with the County Hunters, I enjoyed the fellowship so much I decided to stick around.

"I would like to thank each and every one personally for making the award possible for me. Space does not permit each to be listed here, but I must mention a few. First, if W5HJA had not given me encouragement and spent many hours assisting in study, I would probably not have an amateur radio license today. Also, I must give special thanks to the 488 mobile stations and the many net controls on the County Hunter Nets. Last but not least, my special thanks to Don, K5CKQ, who drove many miles out of his way to give me a contact from Barry County, Missouri, and Copiah County and Walthall County, Mississippi, my last three counties.

"Am I going to work all the counties again? I have already started! Again, thanks to each of you and to Evelyn, and I hope to see all of you at the County Hunters Annual Convention in Asheville, North Carolina in July. 73, Al, KG5J"

333 South Lincoln Ave., Mundelein, IL 60060

Antenna array of ARS KG5J, All Counties #486. Al's photo is in February CQ.

A County Hunter's Wife

by Evelyn Garrett

When Al first started county hunting on the 20 meter bands
I felt for sure I had lost my man.

We sat on the side of the road "God only knows where,"
All I had to do was sit there and stare.

Then some voice with static, noise and clang,
So very far away would come back with a 2–2, bang-bang.

I thought it foolish, didn't want my friends to hear,
Not knowing that to Al it was so very dear.

Soon I had paper and pen in hand,
Logging everything that came over the band.

Sometimes I'd go to bed alone without a peep,
Then I'd hear Paul running the net in my sleep.

Before the band would go haywire at last,
Paul would scold Al for talking too fast.

On the way to Manchester Don gave Al the last County "I hope."
You couldn't have hog tied Al with a rope.

He stirred through his papers then turned with a jerk,
"Gosh," he said, "I've got a rework."

We traveled through sunshine, snow and ice,
But he got his reward and it's real nice.

I love the conventions, so away we go,
Try to say something to all if it's just a "Hello."

We've made lots of friends everywhere we've been,
Looking forward to seeing you all again.

On November 30, 1984 he was floating on a cloud,
He had his USA-CA number and was so proud.

Thank goodness it's over, I said with a grin,
Whatta you know he started again!!!

Awards Issued

Larry Wilson, HH2WL, sent for USA-CA 2500 #597, 12-6-85, endorsed All 20 Meters, All Mobile SSB. Larry also qualified for the 20 meter mobile, SSB endorsement for his USA-CA 2000 #636, 1-12-85.

James Brownlee, KA5IAT, earned the gold seal for USA-CA 1500 #734, 12-6-85.

David W. Rotthoff, KA1EAP, won USA-CA 500 #2078, All CW, Novice Bands, and USA-CA 1000 #909, Mixed.

Orville Otis, K8IU, with his fine signal from Michigan, qualified for USA-CA 1000 #908, All CW.

USA-CA 500 certificates went to:

Hugh P. Dickinson, KK2J, USA-CA 500 #2076, All CW, 12-10-85.

Robert S. Hinshaw, WD6L, USA-CA 500 #2077, Mixed, 12-28-85.

David W. Rotthoff, KA1EAP, USA-CA 500 #2078, All CW, Novice Bands, 12-30-85.

Awards Available

Special WAZ—50th Anniversary Award. To commemorate the 50th anniversary of the WAZ award, *CQ* is offering a special WAZ certificate for those working the 40 zones between January 1 and December 31, 1986. QSL's should be submitted directly to our WAZ Award Manager, Mr. Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904. Sequential numbers beginning with one (1) will be assigned to the WAZ-50 certificates in the order in which the applications are received by W4KA. A handsome plaque will be awarded to the first winner.

The regular WAZ application form, *CQ* Form 1479, should be used. A zone map and application form may be obtained by sending an SASE to W4KA. Contacts may be made on the 10, 15, 20, 40, or 80 meter bands, as this is to be a multiband award. However, contacts made on the WARC bands, 30, 17, and 12 meters will **not** be accepted for this award. Contacts can be made on either CW or SSB. We do **not** plan to issue separate certificates for the different modes.

The processing fee is $5.00 for all applicants. Overseas stations may use IRC's for payment using the present rate of 37 cents per IRC.

The Worked All Zones Award. The Worked

Sandy, GN3BCL, at his QTH, West Balfour House, Banchory, Scotland. Note the contest certificates and CQ awards in the background.

Can you think of a more appropriate license plate for Sandy, GM3BCL? That's a CQ decal on the right side of the window.

Honor Roll

2500		1000		500	
HH2WL	597	K8IU	908	KK2J	2076
		KA1EAP	909	WD6L	2077
1500				KA1EAP	2078
KA5IAT	734				

All Zones Award has available the following kinds of certificates:

I. All Single Sideband (Mixed Frequencies)

II. CW And Single Sideband (Mixed Frequencies)

III. All CW (Mixed Frequencies)

IV. All Phone (Single Sideband and AM) Mixed Frequencies

All QSL cards for the above awards must show a date of November 15, 1945 or later.

V. Single Band

a. All Phone—80M, 40M, 20M, 15M, 10M. All cards must show a date of January 1, 1973 or later. All QSL cards must show SSB.

b. All CW—80M, 40M, 20M, 15M, 10M. All cards must show a date of January 1, 1973 or later. All QSL cards must show CW.

All WAZ Awards require that the applicant's QSL cards show operation on the regular 5 high-frequency bands of 80, 40, 20, 15, and 10 meters **only**.

Mobile stations are not accepted for credit.

XZ9A and XZ5A QSL cards are accepted for Zone 26. Abu Ail Island is in Zone 21. Transkei S 83 QSL cards are accepted for Zone 38. Walvis Bay ZS 3 is accepted for Zone 38. H-51 Bophuthatswana is accepted for Zone 38. KC4AAA can be counted for any of the following zones: 12, 13, 38, 39, 29, 30, and 32. Spratley is in Zone 26.

Use *CQ* form 1479 to apply for the WAZ Awards. Include postage for return of QSL cards.

All requests for information, zone maps, and applications should be sent to Leo Haijsman, W4KA, at the above address.

The Jubilee 150 Award—South Australia. The Colony of South Australia was founded on 28th December 1836, and to celebrate the 150th anniversary of this event, the Wireless Institute of Australia (South Australian Division), Inc. has the pleasure of announcing the Jubilee 150 Award. Through the generous support of the South Australian Tourist Bureau (major sponsor), ESTROW, and Quantas, the award is issued free of charge to radio amateurs and shortwave listeners who satisfy the conditions set out below. There is a handling fee of $2.00, one pound sterlings or 4 IRCs.

1(a). Amateur operators must work stations in the Australian 5th call area (i.e., AX5, VI5, and VK5) to accumulate 150 points, all contacts to be made within the conditions of the operator's license. Contacts to fall within the UTC year January 1st to December 31st, 1986.

South Australia's Jubilee 150 Award.

1(b). SWLs must log stations in the Australian 5th call area (as above) to accumulate 150 points. Each log entry must show not only the Australian call sign, but also that of the station being worked (no "CQ" calls to be included). Logged stations to fall in the UTC year January 1st to December 31st 1986.

2. The points per contact are calculated from the location of the station claiming the award as shown in Table I.

3. Contacts may be made by any mode, on any authorized band, and awards will be endorsed appropriately if requested. Contest contacts are acceptable and DX stations should note that the primary DX contest is the VK/ZL/Oceana contest held on 3/4 October (phone) and October 18/19 (CW).

It is not necessary to submit QSL cards. Log extracts submitted may be checked for authenticity.

4. The log should show the call sign(s), name, and QTH of the applicant, as well as the following information set out in chronological order: date (UTC), station worked (heard), RS(T)* received, RS(T) sent, band, mode, and points claimed.

5. Further information and application for the award should be made to Mr. R. J. Bruce, VK5OU, G.P.O. Box 1234, Adelaide, 50001, South Australia.

United Northwest Inland DX (UNID) News Release. "UNID is happy to announce that we have established our own Awards program. We have awards to catch the interest of any DX'er or SWL (including utility buffs). 'Areo Award,' 'Program Listener Award,' and 'DX Peditioner Award' are three examples. UNID offers a total of twelve awards at this time. All UNID awards are colorful 8½" × 11" very suitable for framing. QSL cards or letters of verification are not required. Complete detailed logs can be used to qualify for the awards. Send SASE and $1.00 US or 3 IRC's for complete rules package. Write to UNID Awards, c/o Gary Stone, East 603 Empire, Spokane, WA 99207, U.S.A."

The SVJF Award. This award is sponsored by the Swedish Railway Radio Club (SRRC) for contact with/reception of members. Scandinavian applicants have to work 5 members, the rest of the world 3 members after January 1, 1964. Endorsements are available for all one mode or all one band.

Send list with complete log data (QSL not required to be in hand) and 3 IRC's or 5 Swedish Kronor or equivalent to award manager: Sven Granbberg, SM3WB, 802 28 Gavle, Kungsbacksvagen 29, Sweden. List of SVJF members is available upon request to the awards manager.

The Texas Armadillo Run

The plans for the Texas Armadillo Run, when the Texas DX Society plans to activate all 3076 counties in the United States plus the special "Armadillo County," are proceeding on schedule. For further information contact Tom Taormina, K5RC, at his new address: 12610 Barbizon, Houston, TX 77089. Tom's telephone number is 713-481-3816. Discussion of the run and further information will also be available at the County Hunter Forum during the Dayton Hamvention.

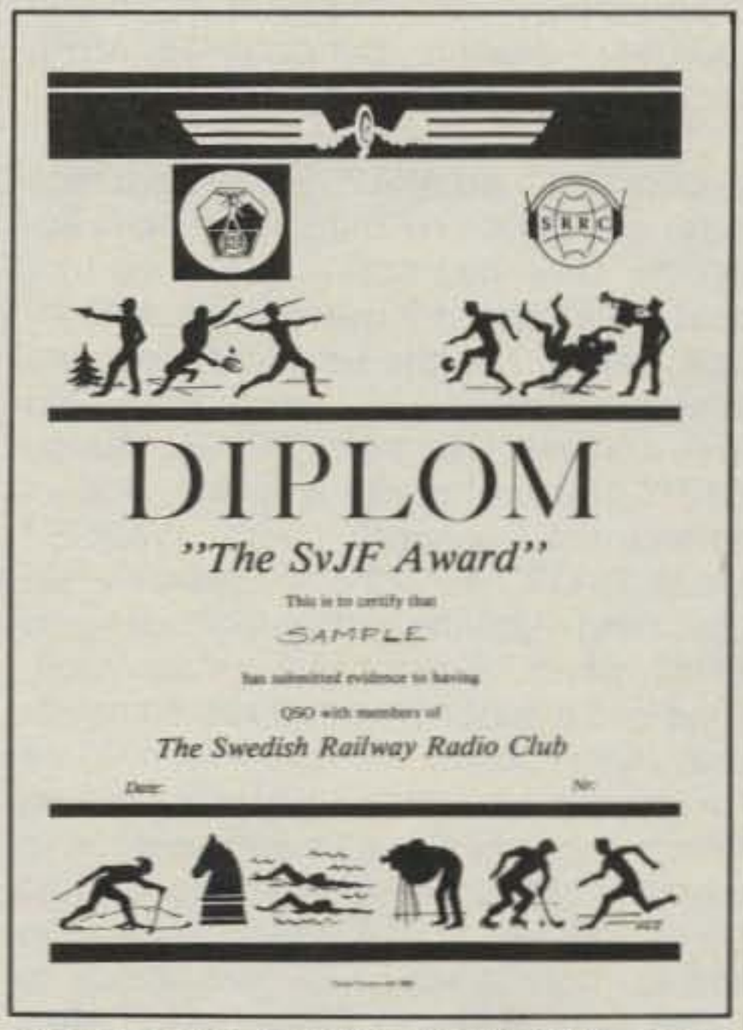
**SWL's should indicate here the station being worked by the South Australian stations.*

QTH/Band	1.8	3.5	7	14	21	28	50 & up
VK5	1	1	1	1	1	1	1
VK1-4 6-8	3	1	1	1	1	2	5
Other Oceana	5	3	2	1	2	3	10
Rest of World	6	5	3	2	3	4	10

Exceptions: Satellite and EME contacts count 5 points. WARC bands count 5 points regardless of location. W.I.A. affiliated club stations count double (VK5WI, WIA, ALE, ALM, ARN, APC, ARC, BAR, BPA, BWR, LZ, RCN, SR). Jubilee station VK5JSA counts 15 points (alternative prefixes allowed). Stations other than VK5 are allowed repeater contacts on VHF/UHF.

Table I– Points per contact by location for the Jubilee 150 Award.

The UNID RTTY Award offered by the United Northwest Inland DX Club.



The Swedish Railway Radio Club offers The SVJF Award.

Of Interest To County Hunters

There will be a gathering of the County Hunters at Dayton during the Dayton Hamvention. A dinner is planned for Friday evening, and there will be a forum at the convention center. Please check your program for times and places. For further information send an SASE to Les Shockey, Rt. 2, Box 36A, Sandyville, WV 25275 or telephone Les at 304-273-3525.

Notes

Springtime is especially welcome this year after a winter of unusually severe weather conditions. We are looking forward to the Dayton Hamvention and hope to see many of you there at the County Hunter Forum. 73, Dorothy, WB9RCY

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Feedback

I'm really glad so many folks are reading this column and writing of their activities. Here are some interesting bits and bytes.

Tom Bishop, KØTLM, of Kansas City, MO wrote in response to our January column comments regarding QRP DXing. Tom related that while on vacation in September 1979 he was operating from a site near London as G5DAO/p when the driver stage in his IC-245 failed and left him with a milliwatt-level transmitter for contesting. With a dipole antenna taped to his fifth-floor hotel room window, Tom worked what he could with the IC-245 output meter hardly moving; he guessed the output power to be 100 to 200 milliwatts. Using this haywire setup, KØTLM worked G4KGT/p, 150 miles distant, representing a QRP DX "record" of at least 750 miles per watt. Bishop says he didn't have much time for the contest due to a next-day departure for his home in the U.S., but he made 9 QSO's with the modest installation described and a blown transmitter. Not bad, Tom!

WB2CZB, a long-time 6 meter enthusiast from Hillsdale, NJ wrote a nice letter about his rather unique and exclusive club, the Six Meter DX Society (311 Liberty Ave., Hillsdale, NJ 07642). The society has four members—K2MUB, WB2MAI, N3AHI, and WB2CZB—all of whom are accomplished 50 MHz DX men. Of this four-man group, it's incredible that two members are named Mario! It's also rather amazing how much DX work these four operators represent: each member has 50 MHz WAS (Worked All States), three of the four have 50 MHz WAC (Worked All Continents), and the lowest 50 MHz DXCC country total claimed by any member is 62 countries! K2MUB and WB2MAI have 71 countries each on 6 meters, while N3AHI has 65 countries. This shows real dedication, and these fellows are to be congratulated on their fine efforts.

The Six Meter DX Society recently honored W6JKV with their "Outstanding 6 Meter DXer" plaque for his accomplishments on the band. Jim, W6JKV, has provided Desecheo (KP5), Greenland (OX), Cocos Island (TI9), Anguilla (VP2), Revilla Gigedo (XF4), Azores (CT2), The Gambia (C5), Cayman Islands (ZF2), Caroline Islands (KC6), Fuji (3D2), and other rare "DX" countries for the 6 meter community over the years. Additionally, W6JKV has provided some of these countries for 144 MHz EME and OSCAR enthusiasts by setting up operations on these bands/modes while visiting rare locations. Jim Treybig, W6JKV, has done a great deal for VHFers the world over and is commended for his excellent work.

Kevin Imel, KA7KGF, of Nampa, ID wrote in response to our October plea for reader input. Kevin says, "This is to inform you of the activity in the southwestern Idaho area, or should I say lack thereof . . . ." I guess KA7KGF hasn't found a lot of local action. He goes on, "In the Boise area there are less than 10 hams active on 2 meter SSB. The rest of the VHF bands are even less 'crowded.' One only has to look at the VHF contest results to see this."

Kevin says that in attempt to stir up a bit more activity, 2 meter SSB nets have been established, but most have been abandoned for lack of interest. One remaining net is run by KD7IY, who looks for check-ins beginning at 2000 hours MST Monday nights on 144.150 MHz. The net control follows a clock's minute hand with his beam heading (a popular technique) so stations in the southwestern Idaho area will know when to listen. KA7KGF encourages anyone with SSB capability to check into the net and help improve weak-signal activity levels. He also pleads for visitors to the area to bring along SSB gear and put out a few calls on 144.200. "Better yet," Imel says, "why not help us activate some rare ones out here?" Kevin's referring to grid squares, I assume, but counties, ARRL sections, etc., can all be good "catches" for those who collect such.

Mike Gottfried, WA2GEZ, wrote a nice letter about his VHF maritime mobile activities. Mike was active from a 20 foot boat sitting about 3 miles south of Montauk Beach, NY (the eastern tip of Long Island) during the ARRL September 1985 VHF contest. Using an IC-290A, Mirage B1016 160 watt power amplifier, and an 11-element Cushcraft beam, WA2GEZ made 71 QSO's in 13 grid squares while operating maritime mobile from rare grid FN40, which covers no land mass. Gottfried had a super time and recommends that others follow his lead and prepare for operations from "water" squares which are otherwise unworkable. Mike says that rather "easy" operations could be established from FM39 (very close to the NJ coastline), FN52 (very close to Cape Cod, MA) and FN40, which Mike himself still needs confirmed! WA2GEZ enjoys operating portable with modest equipment, and was active from FN15, near the VE2/VE3 border, in the 1984 contest. Why not work the 1986 World-Wide VHF WPX Contest this July, Mike? Find somebody with a rare prefix to work with you and set up operations in a unique grid square, and you'll be on top of the world!

N8DJB wrote an interesting letter relating his activities from Pemberville, OH. Craig's been active on 2 meters and 70 cm since early spring 1985, and had already worked 60 grids squares on 432 MHz at the time he wrote. I'd guess he's increased that total some by now. He says, ". . . getting (QSL) cards seems to be a very difficult proposition. However, try to get cards from TV stations sometime. Have 21 states there—mostly on UHF TV—over a 3-year period and only received 6 replies to my detailed cards." Gosh, it's too bad that broadcast stations don't show a better QSL return rate than this. You'd think they'd be pleased to receive DX reception reports.

Craig is running 50 watts on 144 and 15 watts on 432 MHz to a 16-element KLM beam at 118 feet (wow!) on the lower band and a pair of stacked 19-element RIW Yagis at 112 feet on the higher band. N8DJB was working on a 4-bay system using 31-element W1JR-design Yagis for 70 cm and may have it installed by the time this reaches print. He was also working on a 4CX250 amplifier for 70 cm, and hoped the addition of some power would increase his states total (20) on that band. Keep up the good work, Craig, and I hope to hear you on the bands.

Dave Molinelli, WD9IDC, of Warrenville, IL writes a thoughtful letter about his "hilltop" operations from Mt. Hoy, a recreation hill created by a landfill operation. Dave lives in an attached house and has a very modest rooftop antenna for 2 meters, but does most of his VHF work from the nearby hill. His portable station is a Yaesu FT290R running 2.5 watts output to a 4-element KLM beam fed with RG-8X cable and mounted on a 6 foot long wooden dowel. He uses a Janel QSA-5 MOSFET preamp on the 290R's receiver. With this lashup, Dave's worked WA4CQG in AL (grid EM72), about 700 miles from his EN51 QTH. This works out to about 280 miles per watt, if you don't consider the antenna gain (which is probably quesionable), and must have been really exciting! Molinelli has also worked Buffalo, NY; Minneapolis-St. Paul; Omaha, NE; and other good DX from his "hilltop" perch on Mt. Hoy.

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He says his receiver noise is reduced considerably, allowing copy of very weak signals, at the hilltop site (as compared with his home location). This sounds like the noise is man-made, Dave, since atmospheric noise—such as that generated from distant thunderstorms—wouldn't diminish at a better location. In any case, keep up the terrific work and enjoy!

Other Stuff

I read in the December 20th issue of the "2 Meter EME Bulletin" that W5UN, whose antenna system was described in the February column, has now worked 472 stations in 52 countries via 144 MHz EME. Good grief, Dave is doing better than many HF DXers! It was a pleasure to see my own call listed as one of those recently worked (off the moon) by W5UN, and believe me, his station deserves all the credit. Gary, KB8RQ, is an other moonbouncer with a station capable of working just about anyone who can point his antenna toward the moon. KB8RQ has installed 32 modified Cushcraft "Boomers," for a total system which should have about the same gain as W5UN's. Gary says he can hear his own echoes with as little as 8 watts of output power! Thanks to the "2 Meter EME Bulletin" for this information.

I've always wondered if you have to stand on your head to read Australian publications. But now I know that old rumor isn't true, thanks to *6 Up*, an Aussie magazine for VHF/UHF enthusiasts. The *6 UP* magazine is published by Andrew Kay, VK2YLA, and edited by Roger Harrison, VK2ZTB, and comes from Teknidata Services Pty. Limited, Box 844, North Sydney, NSW, 2060, Australia. It is one fine magazine for VHFers and makes very interesting—and sometimes hilarious—reading. I loved the article entitled "See Kew Dorg Eksray" in the summer '85 issue (this is actually our winter here) and am looking forward to more entertaining articles. Perhaps if some of us folks in the northern hemisphere subscribe, the publishers will continue putting out this fine magazine. The price was $3.50 (Australian) per issue, and I'm not certain how this relates to our dollars. I mailed them a check and hope they can figure out what to do with it.

The January issue of "The West Coast VHFer" contained a good tip from Al Olcott, K7ICW, an avid VHF man from Las Vegas, NV. Al related a woeful tale of his recent 144 MHz moonbounce efforts. He refurbished an older 80-element colinear system (4 × 20 element Cushcraft "DX Array") in hopes of working EME but with nil results. After much frustration, Al tried a single 14-element Jr. Boomer propped up on a ladder and heard W5UN off the moon with excellent signals. K7ICW sums up his experience: "What does all this mean? Well, I concluded the hard way that for today's would-be EME (beginning) enthusiast, start simple with a single Yagi, find out the operating schedule of a 32 Yagi station, and go from there, improving step by step." Enlightening comments from someone who's obviously "been there." Thanks to "The West Coast VHF'er" for this.

Also in "The West Coast VHF'er" was an open letter from K6GSS of Cupertino, CA, who was soliciting contacts for the upcoming ARRL January VHF Sweepstakes. K6GSS said, "With clearly over 80% of QSO's coming from the FM mode (groan), I will be putting only about 20% of the time into SSB/CW." Holy mackerel! Can this be true? Here in the northeastern U.S., less than 5% of any "big gun" VHF contester's score comes from FM contacts, but it's apparently very different on the west coast. Any comments from 6-land?

Speaking of the January contest, it was a popular event in these parts. I was active single-op from my home in NJ, and made more contacts in more grid squares than (I've ever) worked before in this contest. Personally, I used 5 bands, 50 through 1296 MHz, and ran kilowatts on all bands except 23 cm. There was a lot of competition among the single-ops, and at this point it's anyone's guess who came out on top. WA3AXV, a "Packrat" (member of the Mt. Airy VHF Club) from the Philadelphia suburbs who has taken national honors in this operating event for more years than anyone can remember, was very much present again in '86. With all the band hopping that prevails in VHF contests, I can't keep track of how everyone is doing. I can say that KC2PX, N2BJ, W1VD, WA2FGK, and other single-ops in my area were very busy. N2SB, the call used by a group from southern NJ, sounded like the front-running multi-op station in these parts. The "big gun" station at W1VD in CT was manned by a single operator this year. What went on elsewhere in North America? Let me know.

Conditions in the January contest were above average here, with strong signals to about 400 miles on 50 through 432 MHz, reasonable tropo on 1296, good meteor scatter on 6 meters shortly after sunrise Sunday, and a surprise *E*-skip opening Sunday evening beginning at about 2345 UTC. The Sunday evening 6 meter *E*-skip was a very welcome eye-opener which lasted for about 90 minutes and produced contacts with a couple of dozen midwest, southeastern, and plains area stations. It was nice to confirm a QSO with WAØDCB in EN42 (IA) via *E*-skip after spending several minutes struggling to work him via meteor scatter 16 hours earlier. At my FN20 QTH the band opened as far west as EN10-11-12 (Omaha area) and EM15 (Oklahoma City area). I snagged some well-known VHFers who have been featured

in this column: WB2OTK/4 (EN84), N4KCM (EM78), WB9MSV (EN50). I think I awakened Ron, N4KCM, with a telephone call very early Sunday morning to make an on-the-spot meteor sked. He sleepily complied, and met me on 50.160 at 1300Z (8 o'clock AM EST), where we quickly exchanged info courtesy of the meteor trails. Sorry to wake you up, Ron, but I needed your grid.

A note regarding meteor scatter work: In the January '86 column I cautioned readers that a major VHF contest is *not* the place to practice scatter techniques. Unfortunately, a lot of VHFers either don't read this column or don't agree with me. I heard many neophytes using the worst possible scatter procedures. I'll delve more deeply into this subject in a future column, but for now let me reiterate that when attempting to work meteor scatter:

- **Don't** use phonetics except for easily misunderstood letters.
- **Don't** speak at a normal conversational pace.
- **Don't** give any information just once, unless you are certain you've caught a "zinger" (prolonged burst).
- **Don't** knowingly talk through a "zinger." Let the other station make a transmission during the same burst.
- **Don't** transmit extraneous information (e.g., your name, state, etc., during a VHF contest).
- **Don't** repeat any information once the other station has acknowledged it.
- **Do** speak quickly and articulately.
- **Do** use phonetics for easily misunderstood letters of your call (but not your entire call—e.g., say W1 Sugar Dog, not Whiskey 1 Sierra Delta, which uses more syllables and doesn't get the info across any better).
- **Do** give information repeatedly until it is acknowledged (e.g., WB2WIK FN20 WB2WIK FN20 WB2WIK FN20 is better than WB2WIK WB2WIK WB2WIK WB2WIK WB2WIK, since the first example makes more efficient use of the transmission.
- **Do** ask for the information you're *missing*, to prevent hearing over again everything you've already acknowledged (e.g., "YOUR PREFIX, YOUR PREFIX, YOUR PREFIX, YOUR PREFIX, YOUR PREFIX" specifically requests the info you need, so the other station won't waste time giving his entire callsign).
- **Do** generate the maximum possible "talkpower" by close-talking your microphone and keeping the gain set low to reduce background noise and distortion.
- **Do** "break" your transmissions to see if you've caught a "zinger" (e.g., K9RO WB2WIK K9RO WB2WIK K9RO WB2WIK K9RO WB2WIK BREAK . . . then repeat a few seconds later).

If all this makes no sense whatever to you, don't feel badly. You're just not a meteor jockey (yet). You'll get there, if you want to. It takes time and experience, but pays off with increased contest scores or whatever your interest.

The January contest offered me the opportunity to use the special 6 meter receiving system I assembled back in June '85 but never had much chance to fool with. This is an Advanced Receiver Research type R50VDA high-level receive converter preceded by ARR type P50VDG GaAsFET preamplifier and driving a solid-state Hammarlund HQ215 receiver as the tunable IF at 28 MHz. I use a 10 dB resistive attenuator between the preamp and the input to the converter because the preamp has much more gain than needed, and excessive gain only reduces the dynamic range of the system. I also run the HQ215 at somewhat reduced front-end gain for pretty much the same purpose. Results? Unbelievable! I find that I can hear anything that can possibly be heard on 6 meters with my antenna and location, but the receiver doesn't overload at all. The band sounds clean, not all garbled by dozens of super-strong stations, and I can hear weak scatter signals right among very powerful locals.

I cannot put numbers on this performance—yet. I do intend to bring my whole 6 meter receiving system to the local RF laboratory in the next few weeks, and will run dynamic performance tests there. I'd be very surprised if the system's com-

pression point is lower than +5 dBm or so at the output of the preamp (this would be about −15 dBm at the preamp input), and if the system cannot resolve −140 dBm in a 1 kHz bandwidth, I'll be shocked. But I'll run these tests, plus a two-signal test for IMD if I can arrange proper equipment, and have the results ready for the May column.

Speaking of performance measurements, I might mention that I've heard a lot of talk lately about "phase noise." It is apparent that most of the folks who discuss phase noise are unfamiliar with the true meaning of the term and haven't any clue how to measure it. "Phase noise" has become an amateur buzzword of the 1980s, and I find this ironic, because prior to 1970 nobody ever heard the expression. Phase noise was only recently (early 1970s perhaps) noticed by the commercial two-way radio folks when they began using such steeply skirted IF filters in FM receivers that they began to wonder why adjacent-channel rejection measurements seemed to be limited by system noise that was not inherent to the receivers themselves. It appeared there was phase jitter (nonsynchronous phase modulation) present on the "pure CW" signals coming from laboratory test equipment, and this noise was becoming the limiting factor in making adjacent-channel measurements.

This jitter, which later became spoken of as phase noise, was more pronounced on the signals generated by modern-day equipment than by the older, tube-type cavity oscillators so popular through the 1960s. Circuit designers began investigating the source of such noise and determined that it was influenced by many factors, including oscillator circuit "Q" and—here's the key word—the phase reference oscillators used in frequency synthesized designs. It seemed that the addition of digital circuits for RF generation and counting was creating an unanticipated problem with close-in spectral purity, and nobody noticed this phenomenon until the two-way FM people began building extremely sharp receivers.

Not to belabor a boring subject, I'll summarize by saying that not all PLL synthesizers produce voluminous phase noise, and there are some RF sources, including crystal oscillators which are not connected to any digital circuits, which produce substantial phase noise. It is true that some popular synthesized amateur equipment produces more wideband hash, phase noise, and all sorts of unwanted signals than did some of the older, purely analog gear. But not all this is phase noise, and I'd appreciate it if nobody mentions phase noise to me again unless they have actually measured it (which isn't easily done). I spent two years of my life working in an RF lab chasing phase noise and can assure you that the difference between a very clean and a very dirty signal, at least with respect to phase noise, is often very small. The common unit of measurement is dB/Hz, and even a poor source might measure −100 dB/Hz.

Now, back to the January contest once more. The contest also permitted me to spend some time operating a Henry Radio model 2004A kilowatt desktop amplifier for 70 cm, and I plan t print a full review of the product soon. The review unit was a bit finnicky, with drifting output power that I'm rather used to seeing from 23 cm amplifiers but for which there is no reasonable explanation at 70 cm. I was able to pull 600 watts output from the 2004A, but this would drift down with heating and then drift up to 700 watts or higher after the unit cooled down. In general, I think the amplifier is a fine product, but I'd like to spend some time evaluating the cause of the thermal drift and then fix it. I'll let you know what I find.

Also planned for product reviews in the very near future are the powerful solid-state amplifiers for 144 and 432 MHz from Microwave Modules Ltd. We received evaluation units of the model MML144/200 and MML432/100 from The PX Shack and have been putting them through the paces. These British-made amplifiers are much bulkier than the American-made amplifiers from Mirage and appear to run more power with less thermal rise than the popular Mirage units. I'd guess the MML432/100, rated at 100 watts output but capable of producing 130 watts with 10 watt drive, would probably perform satisfactorily on fast-scan ATV with minimal video distortion. It uses two output transistors rated at 145 watts dissipation with (!) and is a very conservative design compared with the Mirage D1010.

That's about it for now. Please keep writing!

73, Steve, WB2WIK

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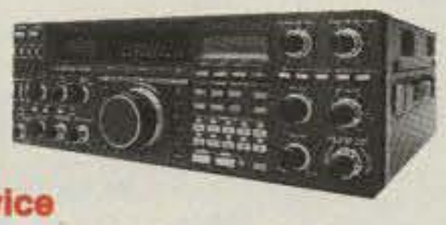

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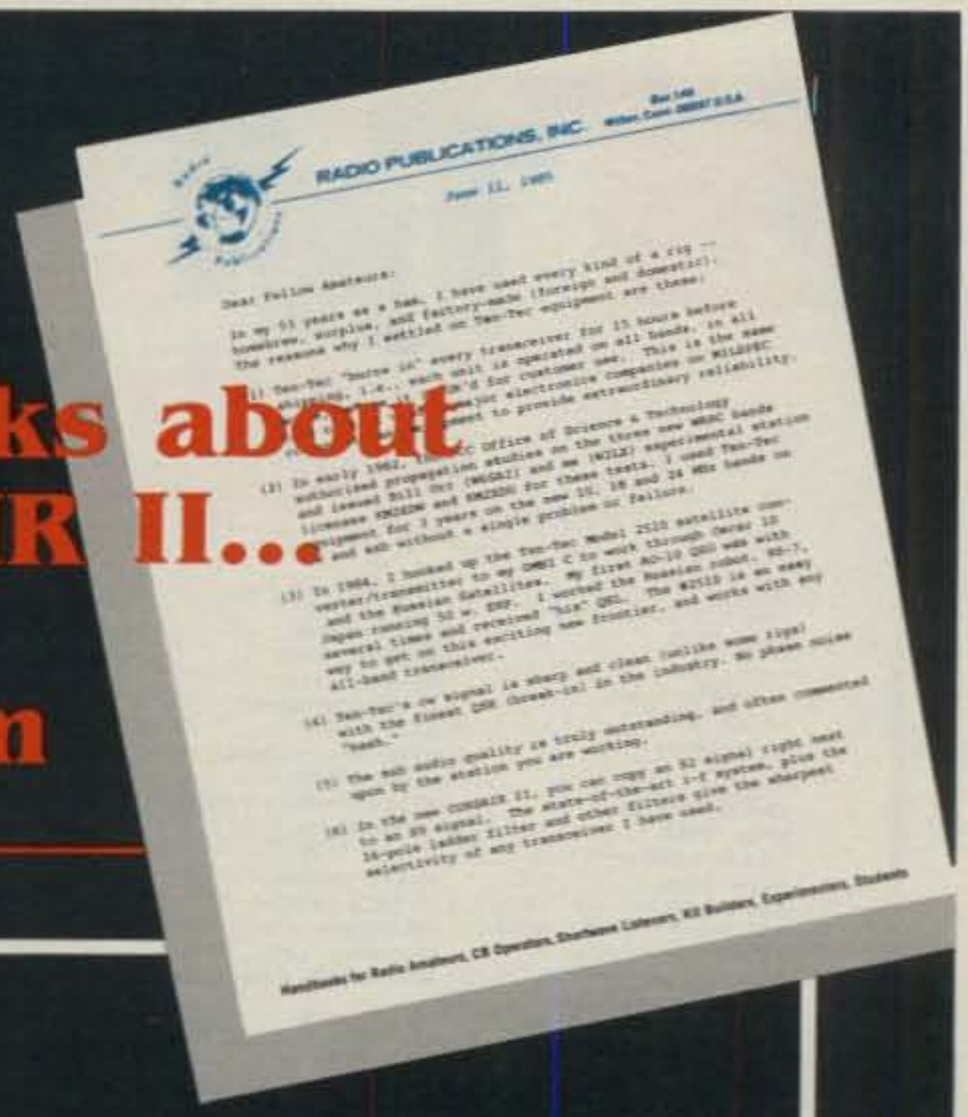
HAVE AM CAPABILITY? Join SPAM (Society for Promotion AM). Membership is free. For free info send SASE to: SPAM, c/o F. Dunlap, WA5TWF, 14113 Stoneshire, Houston, TX 77060.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

We wanted to know what STU COWAN* thinks about TEN-TEC'S NEW CORSAIR II...


RADIO PUBLICATIONS, INC.

June 11, 1985

Dear Fellow Amateurs:

In my 53 years as a ham, I have used every kind of a rig -- homebrew, surplus, and factory-made (foreign and domestic). The reasons why I settled on Ten-Tec equipment are these:

(2) Ten-Tec "burns in" every transceiver for 15 hours before shipping, i.e., each unit is operated on all bands, in all modes before it is OK'd for customer use. This is the same type of test used by major electronics companies on MILSPEC components and equipment to provide extraordinary reliability.

(3) In early 1982, [illegible] Office of Science & Technology authorized propagation studies on the three new WARC bands and issued Bill Orr (W6SAI) and me (W2LX) experimental station licenses KM2XAW and KM2XAV for these tests. I used Ten-Tec equipment for 3 years on the new 10, 18 and 24 MHz bands on and with without a single problem or failure.

(4) In 1984, I hooked up the Ten-Tec Model 2510 satellite converter/transmitter to my OMNI C to work through Oscar 10 and the Russian satellites. My first AO-10 QSO was with Japan running 50 w. SSB. I worked the Russian robot, RS-7, several times and received "his" QSL. The M2510 is an easy way to get on this exciting new frontier, and works with any All-band transceiver.

(5) Ten-Tec's cw signal is sharp and clean (unlike some rigs) with the finest QSK (break-in) in the industry. No phase noise "hash."

(7) The ssb audio quality is truly outstanding, and often commented upon by the station you are working.

(8) In the new CORSAIR II, you can copy an S2 signal right next to an S9 signal. The state-of-the-art i-f system, plus the 16-pole ladder filter and other filters give the sharpest selectivity of any transceiver I have used.

Handbooks for Radio Amateurs, CB Operators, Shortwave Listeners, Kit Builders, Experimenters, Students

In my 53 years as a ham, I have used every kind of rig — homebrew, surplus, and factory-made (foreign and domestic). The reasons why I settled on Ten-Tec equipment are these:

Ten-Tec "burns in" every transceiver for 15 hours before shipping, i.e., each unit is operated on all bands, in all modes before it is OK'd for customer use. This is the same type of test used by major electronics companies on MILSPEC components and equipment to provide extraordinary reliability.

The ssb audio quality is truly outstanding, and often commented upon by the station you are working. Ten-Tec's cw signal is sharp and clean (unlike some rigs) with the finest QSK (break-in) in the industry. No phase noise "hash."

In the new CORSAIR II, YOU CAN COPY AN S3 signal right next to an S9 signal. The state-of-art i-f system, plus the 16-pole ladder filter and other filters give the sharpest selectivity of any transceiver I have ever used.

You can listen to two signals, on different frequencies, at the same time with the optional second VFO for the new CORSAIR — a big advantage for DXers.

Ten-Tec gives you the best service in the industry — just ask any Ten-Tec owner. Turn-around time is usually ten days to two weeks compared to a month or more with other manufacturers. Ten-Tec gives service tips on the phone and offers free replacement modules for 12 months.

"I have never owned more reliable, satisfactory equipment than that designed and built by Ten-Tec in the United States."

-Stuart D. Cowan, W2LX

*Stuart D. Cowan is recognized as one of the world's foremost authorities in ham radio. He is an author of Handbooks for Radio Amateurs, CB Operators, Shortwave Listeners, Kit Builders, Experimenters, and Students. He and Bill Orr (W6SAI) worked together in propagation studies on the new 10, 18, and 24MHz bands as authorized by the FCC. Experiments also included satellite communication. In the experiments he used Ten-Tec equipment for three years on cw and ssb "without a single problem or failure."


Corsair II

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SEVIERVILLE, TENNESSEE 37862

HEWLETT-PACKARD Model 606A signal generator, 50 kHz–65 MHz, for communication equip. servicing. $165 or trade for linear amplifier parts, vacuum capacitors/relays. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

NATIONAL RADIO CO. equipment manuals. Also NCL-2000 factory parts kits. SASE for price list. Max J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

TELEGRAPH KEY made in China for use in China wanted for a private collection. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

TEMPO-ONE with AC-ONE $186.00. U-ship. Tom, K4RV, Rt. 7 Box 168, Lexington, SC 29072 (803-359-3418).

WANTED: Yaesu FR-101(SD) or D receiver, XF10.8HS filter, and TC-2 2M converter. C.T. Huth, 229 Melmore St., Tiffin, OH 44883.

TWO U-100 ROTATORS never used $40 each. Cushcraft A144-10T Oscar antenna never used $45. Butternut HF6V with heavy-duty 160 meter coil $115. G. Skloot, KE2N, 2923 Mandalay Beach Road, Wantagh, NY 11793 (516-221-3535).

WANTED: Drake MN-2700 ant tuner or (MN-2000). FOR SALE: NB-7 noise blanker for TR7 new, $65 ea. Aux 7 band for TR7 new $65 ea. Kenwood: PC1 phone patch, $55. BS-5 pan adapter new $40. TR-7950 2 meter radio, $275. SM220/BS8 monitor scope, pan adaptor, $310. Heathkit: HR10B receiver, $65. HW-16 xcvr, $65. HO-10 monitor scope, $85. SB-600 spkr, $25. Paddle, keyer, $40. Yaesu: SP-107P spkr./phone patch, $55. SP-901P spkr/phone patch $59. CW fil for FT-301, $45. YO-901 monitor scope $375. Drake: R4C 4NB noise blanker, $120. FL-250, FL-1500 filters, $55 ea. Acc'y C4 console, $200 no ant or AC control). MS-4 spkr, now $45. MN75 ant. tuner, new $135. Add freight to all items. K3UKW, Tony Musero, 1609 So. Iseminger St., Phila., PA 19148 (215-271-8898).

WANTED: Ham license plates for following states—AK, CA, CT, DE, ID, KY, ME, MO, MT, NV, NJ, NM, OR, UT, WA. Also Canada. Buy or trade. Willard Prentice, W3VBM, 2419 Chetwood Circle, Timonium, MD 21093.

MILITARY RADIO SETS: GRC, PRC, SRC, TRC, URC, VRC, system components, test equipment, night vision, intrusion det. BEST PRICES, buy and sell. Complete catalog, send $2.00, shipping and handling. MIL-COM EXCHANGE, P.O. Box 982, Orange Park, FL 32067-0982.

HAM RADIO REPAIR! Tube through solid state. Robert Hall Electronics, Box 8363, San Francisco, CA 94128 (408-729-8200).

ANOTHER DAY with an empty mailbox? Improve your QSL returns with Secrets of Successful QSL'ing by Gerry L. Dexter. This complete guide to reception reporting and QSLing SWBC, Utility, ham, and medium-wave stations covers everything from basics to advanced techniques. Just $9.95 plus $1 s/h, $2 s/h foreign orders, U.S. funds only. Order now from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147.

FCC EXAMS, NOVICE–EXTRA: Sunnyvale VEC ARC. Call (408) 255-9000 24 hours. 73, Gordon, W6NLG, VEC.

WANTED: Western Electric, RCA, Cunningham, McIntosh, Marantz, tubes, amplifiers, speakers. Maury, 11122 Atwell, Houston, TX 77096.

ELECTRON TUBES: Microwave Transmitting, Receiving, Obsolete . . . ALL TYPES! Large inventory. Contact: Daily Electronics, P.O. Box 5029, Compton, CA 90224 (213-774-1255).

CB-to-10M CONVERSIONS: FM kits, frequency modification hardware, books, plans, high-performance CB accessories. Free catalog. CBCI, Box 31500CQ, Phoenix, AZ 85046 (602-996-8700).

TENNATEST: Antenna noise bridge outperforms others, accurate, costs less, satisfaction guaranteed. 1–150 MHz. Send stamp for details. W8URR, 1025 Wildwood Rd., Quincy, MI 49082.

MILITARY RADIO SETS: HF, VHF, UHF, Microwave; Radar, Intrusion Detection, TEST EQUIPMENT. Best Prices. Send $1.00 for 1986 Catalog. MIL-COM EXCHANGE, P.O. Box 982, Orange Park, FL 32067-0982.

C64 & C128 SOFTWARE: Send SASE for list. P.O. Box 387, Chillicothe, OH 45601.

UNIQUE HAM KEYCHAIN! 1½ inch miniature H/T (handheld transceiver) made of pewter. Callsign engraved backside FREE! $2.95 each/2 for $5.00 (includes postage). Print callsigns clearly. L. Hunter, N4MUK, Box 382, Maggie Valley, NC 28751.

20% OFF COMPUTER PROGRAMS! Send SASE for free catalog: E.P.O. SOFTWARE, 7805 N.E. 147th Ave., Vancouver, WA 98662.

TUBES: 2000 types, including antique and hard to find. Parts and literature for antique radio buffs. Send $2.00 for 20-page catalog. Antique Electronic Supply, 688E W. First St., Tempe, AZ 85281.

R-390A RECEIVER, .5–30 MHz all modes, 4 mechanical filters, meters sealed (Government removed, operation unaffected): complete/checked $195, complete/repairable $115, spare parts unit (80% complete) $65. CPRC-26 Manpack Radio (described in March 1985 *Ham Radio*), transceives 46–54 MHz FM, with battery box, antenna, crystal, handset: $22.50 apiece, $42.50/pair. Info SASE. CPRC-26 add $4/unit shipping. R-390A shipping charges collect. Baytronics, Dept. CQ, Box 591, Sandusky, OH 44870. Phone 419-627-0460 evenings.

LOGIC PROBE: LED readout shows (F)loat, (H)igh, (L)ow, (P)ulse. Easy kit $12, assembled $18, postpaid. John Day, 1440 #4 Ruby Ct., Capitola, CA 95010.

The ALL NEW 17th Annual B*A*S*H—NEW LOCATION, NEW ENTERTAINMENT, NEW FOOD—will be held on FRIDAY NIGHT of the Hamvention, April 25, 1986. The new location is in the Conference Center at the HARA ARENA AND EXHIBITION CENTER (the same location as the Hamvention) starting at 7:00 p.m. There is no admission charge, and free continuous entertainment. Food and beverages are available. Two exciting top awards, and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. Sponsored by the Miami Valley F.M. Association, P.O. Box 263, Dayton, OH 45401.

C-128 LOGGING AND QSL PROGRAM. 80 Column monitor required. $12.95. W6SBW, WSR Box 9457, Oroville, CA 95966.

RTTY EQUIPMENT: Warehouse full of Model 28/33/35 KSR's, ASR's, TD's, typing reperfs, mod kits and parts, collected over 15 years. Must vacate by June 30th, $5000.00 for lot. Also, RTTY demodulators, video RTTY equipment, gearshifts, motorized paperwinders, paper. Send SASE for complete list and prices. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301. Ph. (612) 255-9794.

AAAA WANTED: Radio tubes (50s, 211, 845). Western Electric Equipment (Tube, Amp, Mixer, Console, Speaker, Driver, Horn, Microphone, Parts, etc.). Triaxial, Coaxial speakers of Jensen, Trusonic, Altec, Tannoy, JBL 150-4C, N-500. David, P.O. Box 832, Monterey Park, CA 91754, Tel: 1-818-576-2642.

BUY, SELL, COLLECT, and restore early tube equipment? Early receivers, tubes, and telegraph gear? Join AWA, which sponsors oldtime "meets," flea markets, museum, and journal with free want ads. Annual dues only $8. Write: Bruce Kelley, W2ICE, Rte. 3, Holcomb, NY 14469.

CHASSIS AND CABINET KITS: SASE. K3IWK, 5120 Harmony Grove Road, Dover, PA 17315.

COMPUTER PAPER AND DISC: Unbeatable prices, SASE, FCS, 9307 Worley Mill, Hillsboro, OH 45133.

CABLE TV CONVERTERS & EQUIPMENT: Plans and parts. Build or buy. Send SASE for information. C&D ELECTRONICS, 626 Flowerdale, Dept. CQ, Ferndale, MI 48220.

COMMODORE 64 OWNERS: Use as a digital readout for your TS-520, FT-101, Collins, etc. (six digits) and 250 MHz frequency counter (8 digits). Send $1.00 for information. GRAND SYSTEMS, Dep't. D, POB 3377, Blaine, WA 98230.

THE RADIO CLUB OF JUNIOR HIGH SCHOOL 22 N.Y.C. INC. is a non-profit organization incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your equipment donation would be greatly appreciated. WB2JKJ via callbook or telephone (516) 674-4072 24 hours, seven days a week. THANK YOU.

"FREE TESTING BEFORE SHIPPING": TS-940/S $1599, TS-430/S $719.50, FT-757GX $749.50, HX-1200 Handheld $235.50, BC-100XL $229.50, MX-5000 $339.50, MX-7000 $399.50, BC-800XLT $329.50, BC-300 $279.50, R-7000 $799.50, R-71A $649.50, R-2000 $449.50, FRG-8800 $499.50, ICF-2010 $269.50. MFJ, CBs, Antennas, MUCH MORE!! FREE UPS SHIPPING & INSURANCE TO 48 STATES. 31 Page 1986 Picture Catalog $1.00 (REFUNDABLE). GALAXY ELECTRONICS, Box 1202, 67 Eber Ave., Akron, OH 44309 (216-376-2402) 9–5 pm EST.

PAY TV and SATELLITE descrambling. Fifth edition, 73 pages. This is the most complete and current guide available. There are working schematics and theory for most cable, UHF, and satellite systems including Anik and Fantasy channels. $12.95. Product catalog $1. Shojiki Electronics Corp., 1327Q Niagara St., Niagara Falls, NY 14303. COD's 716-284-2163.

ELECTRON TUBES: Radio & TV types 75% off list price. Huge inventory! Also industrial types. Send for the free catalog today or call toll free (800) 221-5802. Send for 80% off tube listing. Box CC, Transleteronics, Inc., 1365 39th St., Brooklyn, NY 11218. See our display ad this issue.

LOW PRICED QSL CARDS: 100 for $5.00 and 500 for $20.00. Add $1.75 for shipping and postage. SASE for samples. Kenneth Hand, WB2EUF, P.O. Box 708, East Hampton, NY 11937.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Swan, and all others. Six ½" digits. 5" wide by 1¼" high metal cabinet. Send $1.00 for information and receive a $25.00 discount. Please be specific. GRAND SYSTEMS, Dep't. D, POB 3377, Blaine, WA 98230.

WANTED: Drake RV75 VFO and TR7 Service Kit. Michael Nemesh, W3PVV, 502 Green Street, Freeland, PA 18224.

WANTED: Henry 2K3 or 2K4. Paul Solek, P.O. Box 43, Reynoldsburg, OH 43068-0043.

TEN-TEC 515 transceiver, matching filters, AC supply, 405 amp. Excellent, package only, $395. Cheap mobile, backup SSB/CW, HR20/HX20, matching speaker, AC/DC supplies, Ameco preamp, coax, antenna. Excellent, $199 or best offer. W6NRJ, 16573 Sioux Lane, Gaithersburg, MD 20878.

HAMS: Make big money in technical writing. Special report $3. Dr. Roger Moody, WA3NFW, Research Consultant, 7525 Riverdale Road, New Carrollton, MD 20784.

FOR SALE: Knight 50 watt Transmitter. Matching VFO 10–80 meters, $75.00. Collins Type 32V Transmitter, $250.00. Donald M. Cox, 318 Park Blvd., Orange Cove, CA 93646 (209-626-4219).

WANTED, MILITARY/COMMERCIAL COLLINS EQUIPMENT. WE NEED 618T, RT-743/ARC-51, ARC-94, ARC-102, RT-712/RC-105, ARC-114, ARC-115, ARC-116, RT-857/ARC-134 or Wilcox 807A, ARC-159 or Collins 719A, ARC-164, ARC-186, RT-859A/APX-72, RT-868A/APX-76, ARN-89, ARN-118, RT-1159/A, MRC-95, 718F-1/2, HF105, KWM-2A, 516F-2, PM-2, 312B-5, 30L-1, 302C-3, Antenna Couplers 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 180S-1, 70K-9 PTO. Anything Collins old or new. We also service. Our 30th year. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, 704-524-7519. Slep Electronics Company, Highway 441, Otto, NC 28763.

BEAUTIFUL CERTIFICATE commemorating your first QSO. Send SASE for application. Award, 1335 N. Harbison Ave., Indianapolis, IN 46219.

LOW PRICES - FREE SHIPPING Continental USA. Butternut, Mosley, Nye, Mini-Quads, Dipole kits. Stamp for flyer. HART EASTERN COMMUNICATIONS, 1444 Darlington, Derby, NY 14047.

ROSS'$ NEW SPECIALS (APRIL only): ROBOT 1200C $1199.90. ICOM IC-45A $279.90, IC-04AT $286.90, IC-490A $509.90, IC-751 $1099.90. KENWOOD TS-940S/WAT $1689.90, R-1000 $334.90, TR-3500A $249.90, TM-2550A $384.90, TS-430S $688.50, TM-201A $279.90, TR-8400 $349.90, TS-180SDFC $579.90, VFO-120 $139.90, YAESU FT-209RH & FTS-6 $294.90, FT-757GX $PHONE, FRG-7700 $369.90, FRG-8800 $499.90, YR-901 $399.90, FT-203R $169.90. Over 7500 ham-related items, all major lines. Send Call letters, name & phone #for personal price quote. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

SELL: SB-200 Heath Linear. Good condition. Postpaid $270. Dick Scott, 371 Claymore Blvd., Richmond Hts., OH 44143.

MINT: IC-740 w/FM $529. TR-7730 $225. TH21-AT $149. D104 w/G stand $25. Heath HD-15 Patch $25. Jack, KOØE, 3019 Gabriel View Dr., Georgetown, TX 78628. Tel. (512-863-4043) nites.

WANTED: RME-9D. Also, RME-70, 3R9, 5T5, and CT-100, etc. D.J. Lowenstein, N7AF, 235 E. 15th St., Tempe, AZ 85281.

FOR SALE: Heath HW-16 and matching HG-10B VFO. $100 + shipping, or offer. Call Doug Kiessling, 703-821-0509, or write 7414 Colshire Dr. #8, McLean, VA 22102.

BUTTERNUT HF6V with 160 meters, heavy-duty coil. Also 2 meter meteor skeds wanted. KE2N, G. Skloot, 2923 Mandalay Beach Road, Wantagh, NY 11793 (516-221-3535).

NEEDED: Looking for any information on putting the Macintosh Computer on RTTY and AMTOR. Would like to bring RTTY and AMTOR along on next DXpedition to Pacific and Antarctica. Please write: KD7P, Robert A. Winters, 5633 123rd Ave. S.E., Snohomish, WA 98290.

NOVICE RADIO OUTLET New and used equipment dealer! *Used Heathkit SB-102 transceiver, w/manual, power supply, $215.00. Large SASE for equipment list! Free shipping U.S.A. 919-286-7927. 1604 Delaware Ave., Durham, NC 27705.

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FINAL/DRIVER PACKS. Factory-fresh matched GE 6146B's W/12BY7A or 6CL6. $28 ppd in USA. Spencer Tube Co., Box 24 RD2, Corning, NY 14830.

H*A*R*K-Radio Archives "low-tech" newsletter. Recollections & reprints. $1/$6. Arnold Timm, KAØTPZ, 2308 Garfield #304, Minneapolis, MN 55405.

WANTED: Drake 6 kHz AM filter for R-4C receiver. R. Voelker, 101-23 Lefferts Blvd., Richmond Hill, NY 11419.

FOR SALE: Good 833A tubes w/sockets, filament transformers, $50 each. W7KE, 1109 S 2nd, Hamilton, MT 59840.

SELL: Hallicrafter Model S-R 150 Transceiver, MFJ RTTY/CW Computer Interface, Commodore 64 computer with disk drive, printer, datassette, and modem, also many other items. Send SASE for complete list and price. Also wanted Realistic Dx-302. State price. Fred Allen, Box 1771, Grand Forks, ND 58206-1771 (701-746-0073).

ICOM IC22 (xmtr works low pwr only) with Drake AA10 10W amp & Pipo 16 key TTP $100. Kenwood TR9000, BO9 base & Cushcraft 7 ele beam $315. C. Bright, 4115 Buckley Ridge, St. Louis, MO 63125.

WANTED: B&W 160 BCL center link coil and 160 HDVL swinging link coil. Q.R. Galbraith, K5TVC, 4303 Kingsway Dr., Farmington, NM 87401.

WANTED: Any used amateur equipment. HAØDU, Box 16, Debrecen, H-4003 Hungary.

FOR SALE: Mint Drake TR-4 w/NB, AC-4, RV-4, MS-4, MFJ CW filter, EV-638 mike, custom covers, cables, manuals—clean inside and out! You ship. $450 or B.O. KA1BFV, 31 Duane Ln., Burlington, CT 06013.

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WANTED: Ham call plates from NV, KY, NJ to complete WAS. Will pay cash. Brad, WA1LZL, RFD #2, Box 339, Ellsworth, ME 04605.

WANTED: DX ENGP speech processor model Collins 32S. WB6ALC, Box 332, Covina, CA 91724.

PRECISION: E-200 Marker Generator $18, Auto-Reg Power Supply 0-50 VDC @ 10 Amp $50, R.F. Sign-Gen $20. K6KZT, 2255 Alexander, Los Osos, CA 93402.

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WANTED: D.C. Coaxial Relays with type "N" connectors. Heliax ⅞ & ½ inch. Clem, W8VO, 33727 Brownlea, Sterling Heights, MI 48077.

SELL: Info-tech model 75 converter, Info-tech keyboard model 150, manuals, $150.00. You pay shipping. Joseph Schwartz, K2VGV, 11 Windham Loop, 1JJ, Staten Island, NY 10314, phone (718) 698-8069.

Antennas

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RMKII	roof mtg. kit	41.95
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215WB	15 el. wide band 2mt. boomer	79.95
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416TB	16 el. OSCAR 435 MHz	56.00
A144-10T	10 el. OSCAR 145.9 MHz	49.00
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RM20/RM20S	std. & super resonator	15.95/21.95
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RM40/RM40S	std. and super	17.95/24.95
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SSM-2	stainless ball mt.	17.95
SSM-1	stainless ball & spring mt.	32.95
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HOT	trunk mt. w/swivel ball	16.95
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EX-14	4 el. triband	362.95
TH3JRS	3 el. 750W pep	218.95
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V2S	2mt. omni-direct	50.95
V4	70cm omni-direct	59.95
HB144MAG	2mt mag mt	21.95
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H*A*R*K: 1986 "low-tech" Calendar. 8½"×11" xerox. Crystal set nostalgia. ($1.) 2308 Garfield #304, Minneapolis, MN 55405.

EASY RTTY/CW: Drake (Tono) 7000E terminal, BMC 12" green monitor, $350. Epson MX-80 available. K1LEC, N. Springfield, VT 05150-0073; (802) 886-8121.

FOR SALE: Swan 500C with manual & PS $300.00. SWAN 350A manual has built-in AC/DC $200.00. FT101E mike, manual, & org. box, works on AC only $375.00. R/S SW receiver manual & org. box $100.00. R/S Pro-30 handheld programmable scanner $150.00. Midland 13-500 2 mtr. rig with eight rocks in it, comes with mike & manual $75.00. More infor send SASE to Box 518, Whitehouse, FL 32220.

NCL-2000 Bandswitch $25 P.P. Spare Parts list SASE. Maximilian Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

WANTED: Collins 75S-3C, 32S-3A, 312-B4, 51S1, SM-3, MM-1, 200-500-800-3.1 kHz filters for 75S3B,C. SELL: 60' steel self-supporting tower, VERY STRONG!, $400. T.N. Colbert, WA8MLV, Burton, Ohio 44021.

SELL: Hustler 6 & 2m cowl-mount mobile ant, $15.00. Drake WV-4, $55.00. Wanted: Mirage A1015 and B3016 amps. K8MK, 690 Vermilion Trail, Gilbert, MN 55741.

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HELP!! Need schematic and operating instructions for Lazer 3000 amplifier. Will pay. KA2VHY, P.O.B. 353, Palmyra, NJ 08065.

FOR SALE: Connectors, UG21 type "N" for RG213 or RG8 $2.00, UG88 BNC male for RG58 75¢. R. Thompson, 626 Valkyrie, K.I. Sawyer AFB, MI 49843.

WANTED: Heath HW-7 in good condition for QRP collection. KT1H 603-224-5737.

FOR SALE: Johnson Invader Transmitter, Globe Chief Transmitter, Heath HW-32A, Hallicrafters SX-100, Hewlett Packard 200J Audio Osc, Millen R-9er. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, MA 01056.

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WANTED: B&W BCL and HDVL coils. 160–10 meters. Any Condition. Q.R. Galbraith, K5TVC, 4303 Kingsway Dr., Farmington, NM 87401.

FOR SALE: Mobile Mount for Azden PCS-3000 $10. Two mikes for PCS-3000: one with Touchtone $20, one without $15. You ship. KA1BFV, 31 Duane Ln., Burlington, CT 06013.

HOMEBREW keys or paddles wanted for a private collection. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

CANADIAN HAMS! FOR SALE: Heath SB-104 transceiver, SB604 power supply with speakers, HM 2140 pwr meter, HD 1410 keyer factory assembled, $1200 Canadian. Also for sale: HR1680 rcvr HF 9 tuner, SP99 speaker, Eico 460, oscilloscope. L. Markus, 7434 Kingsway #409, Burnaby B.C. V3N 3B7, Canada, Tel: 604-525-2266.

WANTED: Hand key J-38 WW II vintage. R. Scott, W8FDN, 371 Claymore Blvd., Cleveland, OH 44143.

WANTED: Manual for Hammarlund HQ 170. M. Rosen, N3BQA, 20 W. Madison St., Baltimore, MD 21201.

ZIMMBEAM: Phased "V" beam antenna (K4JZB), need technical help, send tel. no., arrange SKED. Gary van Overloop, VE6BIJ, 4444 33 St., Red Deer, Alberta, Canada T4N 0N4.

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WANTED: 1958 or later KNIGHT-KIT "SPAN-MASTER" 4 band receiver. Gary Flechtner, 188 North State, Route 101, Tiffin, OH 44883 (419-447-8229).

WANTED: B&W HDVL and BCL coils, any band any condition. Also grid dip meter. Q.R. Galbraith, K5TVC, 4303 Kingsway Dr., Farmington, NM 87401.

WANTED: Manual for Heathkit Seneca VHF-1 6&2 mtr. transmitter. Clem Duval, 33727 Brownlea, Sterling Heights, MI 48077.

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WANTED: Hammarlund HQ-145 communications receiver. Donald Trayes, 38 Elmwood Place, Goose Creek, SC 29445.

WANTED: Instruction manual and schematic for General Radiotelephone Model MC-5. Bill Fitzpatrick, R3 Box 232, Anamosa, IA 52205.

FOR SALE: Swan 500CX 10–80, PS and manual $300. FT101E 10–160 AC only, mic and manual $300. R/S DX160 receiver and manual $100. Midland 13–500 12 channel 2 meter rig with manual and mic $75. Swan 350A with built-in AC/DC mic and manual $200. More info send SASE to Box 518, Whitehouse, FL 32220.

FOR SALE: TS660 four band including 6 meters, all-mode rig. $475. FT221 all-mode 2 meter rig. AC and DC with repeaters operational on 145.00 MHz, $295. Chas Royer, 847 N. La Crosse St., Allentown, PA 18103.

FOR SALE: 75S1, 32S1, 516F2, $450; 30L1 $400; 62S1 $475; 75A4 $300; 75S3-A $350. James Craig, W1FBG, 32 Birchwood, Rye, NH 03870 (603-964-6658).

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REUNION: 565th-574th SAW BNS. July, in Buffalo, NY. For details write to Angel M. Zaragoza, W6ZPR, 1571 9th St., San Bernardino, CA 92411.

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WANTED: Yaesu FC-901 ant. tuner. State Price and condition. Write Jack Fridley, KA0EEV, Box 284, Strawberry Point, IA 52076.

WANTED: Yaesu FR-101 D or SD receiver and Rack Mounting brackets for AN/URA-17 converter. C.T. Huth, 229 Melmore St., Tiffin, OH 44883.

FOR SALE: ICOM IC-2AT, DC-1, BP-4, service manual, $250 mint. ICOM IC-4AT, DC-1, BP-4, HM-9, service manual, $275 mint. WB9RJY, Earl M. Schultz, 904 21st St. #33, Lincoln, IL 62656.

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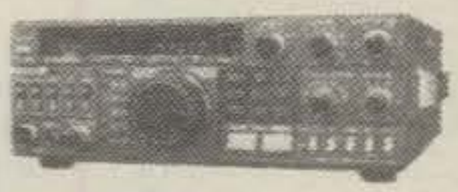

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ICOM Automatic HF Antenna Tuner

AH-2

ICOM presents the AH-2 automatic antenna tuning system for the IC-735 all band HF transceiver. The AH-2 is ideal for mobile operators since there is no manual antenna tuning needed...an advantage in inclement weather. Also, the AH-2 system enables auto tuning in areas where antennas are limited, such as apartments and condominiums.

The ICOM AH-2 System combines advanced matching techniques and rugged construction for indoor or outdoor

use to match frequencies from 3.5MHz to 30MHz. The system includes an antenna element, and the AH-2a tuner and controller units.

The AH-2a Tuner Unit enables optimum matching conditions via its built-in 8-bit microcomputer and LC (coil/capacitor) circuit. More than 260,000 LC combinations are possible.

The AH-2a Controller Unit easily attaches to the side of the IC-735 HF transceiver. By simply pushing the TUNE button on the front panel of the AH-2a controller unit, the controller automatically tunes from 10 to 80 meters in less than six seconds. It can also be used on the 160 meter band with an extension of the stainless steel whip.

The AH-2a tuning unit is housed in a durable weather-resistant case and is capable of storing tuning information for eight different frequencies. Retreiving tuning data from the memories is accomplished in less than one second!

The AH-2a can be purchased separately to accommodate the ham who already has a bumper mount and whip antenna, or the apartment/condo dweller who wants to match a random wire.

The antenna element includes sturdy bumper mounts which hold the 107 inch stainless steel whip in place, plus all the necessary hardware.

For the ideal mobile station, look at the IC-735 transceiver and the AH-2 automatic antenna system...they're quite a match.

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